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EXPLAINING THE FIJIAN CHILDHOOD MORTALITY DECLINE

Trends, levels and government response

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to the Faculty of Science, University of London.

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ABSTRACT

The trends and levels in childhood mortality from the cession of Fiji to the British in 1874 to the most recent census in 1986 are described and analysed. The core, and more detailed, analysis covers the period from 1893 -- when the first major Government inquiry into the decrease of the population was carried out -- to the late 1960s when relatively low mortality was reached. Both direct and indirect demographic methods are used to estimate levels of mortality. Explanatory material is drawn from a variety of documentary and ethnographic source describing the disease environment, public health programs, and changing technology.

The social, cultural and biological determinants of infant and child mortality are considered. Special attention is given to the role of the Colonial Government, in public health policy, in the use of medical interventions, and in the establishment of a medical infrastructure.

In the first decades of the 20th century the Government initiated a number of public health interventions. The effects of these on child mortality are evaluated in the context of the disease environment. In the late 1920s and 1930s, they were supplemented by a child welfare campaign aimed at the active involvement of the village communities. Despite the modernity of this campaign its effects on child mortality were limited.

The demographic analysis suggests that the "breakthrough" in Fijian child mortality, the period of steep decline over a relatively short time, came in the late 1950s. The factors contributing to this are explored and it is concluded that major elements in the accelerated decline were successive specific disease-related campaigns (particularly against tuberculosis and yaws) pushed through by an activist Government, making use of new medical technologies and drugs, and building on the decentralised medical infrastructure developed over the previous half-century.

Fiji offers a rare opportunity for a study of this kind, since the Government was concerned from the outset of colonial rule with the problem of Fijian depopulation, and the place within it of child mortality; the need for an accurate system of vital registration was early recognised, and active programmes of public health and medical intervention pursued and well documented.

TABLE OF CONTENTS

LIST OF TABLES	7
LIST OF FIGURES	9
ACKNOWLEDGMENTS	10
CHAPTER I: INTRODUCTION AND HISTORICAL BACKGROUND	12
1. Introduction	12
2. Geography	21
3. History	22
3.1 Pre-cession	22
3.2 The early colonial period	23
3.3 Vital statistics	24
3.4 The Inquiry into the Decrease of the Native Population	25
4. The Report of the Commission	27
5. Some Contributing Factors to High Childhood Mortality in the late Nineteenth Century: Colonial and Fijian Perceptions	29
5.1 Condition and status of women	29
5.1.1 Women's work	29
5.1.2 Changing customs in relation to family life	33
5.2 Breastfeeding	35
5.3 Food and nutrition	38
5.3.1 The food system at the time of cession	38
5.3.2 Food balance	39
5.3.4 Food scarcity	40
5.3.4 Food tabus and restrictions	40
5.3.5 Weaning diet	42
5.4 Diseases	43
5.4.1 The pathological environment	43
5.4.2 Epidemics	44
5.4.3 Causes of death from illness in early childhood	45
Ramu	45
Diarrhoea/Dysentery	45
Tuberculosis	46
Yaws	47
5.4.4 Summary	48
5.5 Systems of exchange	48
6. Conclusion	49
Notes to Chapter I	51
CHAPTER II: SOURCES OF DATA AND MEASURES OF CHILDHOOD MORTALITY	56
1. Introduction	56
2. Sources of Data on Infant and Child Mortality	56
2.1 The censuses of the population	56
2.2 Registration of births and deaths	59
2.3 Reports of vital statistics	61
2.4 Evaluation of data on vital events	62
3. Other Sources of Data and Evidence	65
3.1 Medical Department reports	65
3.2 The Fiji Fertility Survey	67
4. The Measurement of Childhood Mortality	67
4.1 Direct methods of estimating mortality	68

4.2	Indirect estimates of childhood mortality: an evaluation of the Brass method in the Fijian context	70
4.2.1	Age reporting and reporting of children ever born and dead	73
4.2.2	Declining mortality	75
4.2.3	Differential mortality by age of mother	77
4.2.4	Changing patterns of fertility	79
4.2.5	Choice of mortality model	80
4.2.6	Completeness of registration 1976-1986	84
4.2.7	Summary	86
5.	An Assessment of the Causes of Declining Vital Registration after World War II	86
6.	Conclusion	89
	Notes to Chapter II	90

**CHAPTER III: INFANT AND CHILD MORTALITY 1896-1927:
GOVERNMENT PROGRAMMES AND FIJIAN RESPONSE 93**

1.	Introduction	93
2.	The First Decade	93
2.1	Medical provision at the end of the century	93
2.2	The O'Brien years	96
2.3	Development of the health infrastructure	100
3.	Public Health Programmes, 1910-1930	104
3.1	Introduction	104
3.2	The provincial context	106
3.2.1	Bua	111
3.2.2	Ra	113
3.2.3	Lau	115
3.2.4	Conclusion	117
3.3	Sanitation programmes, 1920-1930	118
3.4	Conclusion	120
4.	The Pathological and Disease Environment and Medical Response	120
4.1	The pathological and disease environment	120
4.2	Diseases in Fiji	121
4.3	Causes of childhood mortality	127
4.4	Disease-specific medical and public health intervention	131
4.4.1	Dysentery	132
4.4.2	Yaws	135
4.4.3	Hookworm	138
4.5	Conclusion	139
5.	An Evaluation of the Medical and Public Health Initiatives: 1897-1927.	140
	Notes to Chapter III	152

CHAPTER IV: THE CHILD WELFARE CAMPAIGN: 1927-1939 156

1.	Introduction	156
2.	Levels and Trends in Childhood Mortality: Direct and Indirect Estimates.	157
3.	The Child Welfare Campaign	162
3.1	Origins of the Campaign	162
3.2	The aims and methods of the Campaign	164
3.3	Expansion of the Campaign	169
3.4	An overview of the progress of the Child Welfare Campaign in its first decade	169
3.5	Other social and public health programmes	173
4.	Evaluation of the Child Welfare Campaign	175

4.1	Changes in child mortality rates	175
4.2	The decline in neonatal and infant mortality	179
4.3	Child Mortality in the 1930s	183
4.4	Resistance to changes in the diet of children	186
4.5	Barriers to taking children to hospital	187
4.6	Use of traditional medicine	191
4.7	Conclusion	192
	Notes to Chapter IV	196
CHAPTER V: THE ROUTE TO LOW MORTALITY		200
1.	Introduction.	200
1.1	Mortality decline	200
1.2	The Caldwell analysis	201
2.	The Breakthrough in Child Mortality in Fiji.	203
3.	Health Services and Child Welfare: Pre-breakthrough	210
3.1	The war years	210
3.2	Post-war reorganisation of government and health services	212
3.3	Conclusion	215
4.	Public Health Programmes and Campaigns: 1950 to the late 1960s	216
4.1	Introduction	216
4.2	Health care provision	217
4.3	Child welfare work	219
4.4	Obstetric and antenatal care	220
4.5	Sanitation	223
4.6	Nutrition	225
4.7	Disease-related programmes and campaigns	227
4.7.1	DPT: Triple antigen vaccination for diphtheria, pertussis and tetanus	227
4.7.2	Yaws	233
4.7.3	Tuberculosis	233
	(a) Prevalence surveys and vaccination programmes	237
	(b) Case-finding and follow-up	240
4.7.4	Infantile diarrhoea	243
4.7.5	Poliomyelitis	246
4.7.6	Smallpox	247
4.7.7	Enteric fever	247
4.7.8	Hookworm	247
4.7.9	Filariasis	247
4.7.10	Important childhood diseases with no control programme	248
	Respiratory diseases	248
	Measles	248
5.	The Social Context prior to and during Breakthrough	251
6.	Conclusion	260
	Notes to Chapter V	272
CHAPTER VI: POSTSCRIPT AND CONCLUSION		279
1.	Introduction	279
2.	Postscript	279
2.1	Medical provision	281
2.2	Mortality differentials	282
2.2.1	Education and place of residence	283
3.	Conclusion	285
	Notes to Chapter VI	292

APPENDIX A:	Census questions on children ever born and surviving or dead	293
APPENDIX B:	An evaluation of the data on children ever born and children dead from the 1946, 1956, 1966 and 1976 censuses used in the Brass method for estimating childhood mortality	294
APPENDIX C:	Measurement of literacy in the 1911, 1921, and 1936 censuses	301
MAP 1:	Map of Fiji - 1976	302
MAP 2:	Approximate Location of Provincial Boundaries - 1915	303
MAP 3:	Location of Hospitals and Dispensaries: Distribution of Fijian Population - 1956	304
MAP 4:	Distribution of Fiji-Indian Population - 1956 . .	305
ABBREVIATIONS AND ACRONYMS	306
BIBLIOGRAPHY	307

LIST OF TABLES

Table I-1	Illustrative demographic analyses of trends in childhood mortality	18
Table I-2	Dietary reference values for pregnant and lactating women and children, and common Fiji food sources	41
Table I-3	Nutrients furnished by immature coconuts (liquid and soft meat) compared with human and cows' milk	41
Table I-4	Annual infant mortality rates: Fijians 1886-1901	45
Table II-1	Average number of villages and population per Buli: 1891 Census	59
Table II-2	Comparison of census and vital registration estimates of population change (Fijians)	63
Table II-3	Definitions of direct methods of estimating mortality	68
Table II-4	The minimum percentage of women reporting an inaccurate terminal digit in age (Myers Index): 1956-1986 censuses (Fijians)	73
Table II-5	Average number of children ever born to women in age groups 15-49 (Fijians)	73
Table II-6	Proportions of children dead to women in five-year age groups 1946-1986 (Fijians)	75
Table II-7	A: Percentage of Fijian women never married by age B: Singulate mean age of marriage: Fijian women	79
Table II-8	Percentage of those dying under 5 who die between 1 and 5, under assumptions of Coale-Demeny model life tables, and q1 at each level	81
Table II-9	Infant mortality rate and percentage of deaths under 5 who died between 1 and 5 (1893-1915 and 1923-1986)	83
Table II-10	Registered and expected births and deaths: Fiji 1982-1986	85
Table II-11	Differences between direct and indirect estimates of childhood mortality: 1935-72	87
Table III-1	Medical provision for the Fijian population, 1910-1935	102
Table III-2	Literacy in Fijian	108
Table III-3	Distribution of diseases among admissions to provincial hospitals, 1910-1936	123
Table III-4	Leading causes of childhood death by age	130
Table III-5	Dysentery cases, 1911-1921	133
Table III-6	Proportionate decline in component mortality rates, 1900-1928	143
Table III-7	Period estimates of infant and child mortality	144
Table IV-1	Fijian stillbirth and child mortality rates (1914-44)	176
Table IV-2	Change in component period mortality rates in selected low-moderate mortality countries at the time of the World Fertility Survey	178

Table IV-3	Period mortality rates (direct): 1927-1939 (Fijians)	183
Table IV-4	The timing of epidemics and associated mortality	184
Table V-1	Gains in life expectancy over the breakthrough periods: Sri Lanka, Kerala, Costa Rica and Fiji	204
Table V-2	Breakthrough period defined	209
Table V-3	Health professionals and health centres at "Breakthrough" per 1000 population .	216
Table V-4	Medical staff (establishment), 1950-66 .	217
Table V-5	Fijian outpatients (all hospitals and dispensaries): 1947-66	218
Table V-6	Births and antenatal visits, CWM Hospital: Fijians, 1946-66	221
Table V-7	Selected characteristics of pregnancy and birth, 1959-61	222
Table V-8	Immunisation, 1964-65	229
Table V-9	Notified infectious diseases: numbers and rates per 100000 Fijian population .	231
Table V-10	Level of reaction to Mantoux test (Fijians)	239
Table V-11	Tuberculosis (hospital morbidity)	242
Table V-12	Infantile diarrhoea: cases notified, 1946-66	244
Table V-13	Proportion of male Fijian population engaged in each major group of industries: 1956 census	253
Table V-14	Net profit assessed for tax, 1957	253
Table V-15	Proportions of Fijians and Fiji-Indians who attended school for 6 years or more, 1966	257
Table V-16	Summary of timing and effectiveness of programmes and campaigns	263
Table VI-1	Medical provision, 1966-1984	282
Table VI-2	Differentials in childhood mortality (education and place of residence): FFS	283
Table VI-3	Differentials in childhood mortality by place of residence (1980): 1986 census .	284
Table B-1	Women never married in younger age groups: 1936 to 1976 censuses	295
Table B-2	Fijian women never married; never married with one or more children; average children ever born to never married women. Fiji Fertility Survey (1974)	295
Table B-3	Women with nine or more CEB/SL (1956) .	296
Table B-4	Correction factors for 1956 census based on the 1966 census	297
Table B-5	Average number of children born to women in age groups 15-49	298
Table B-6	Proportions of children dead to women in age groups 15-49	299

LIST OF FIGURES

Figure I-1	Population growth, 1881 to 1986	13
Figure II-1	Fijian childhood mortality 1933-1976: direct and indirect estimates	64
Figure III-1	Variation in the decline in infant mortality by province (1900-1915)	107
Figure III-2	Fijian provincial IMRs 1894-1915	107
Figure III-3	Fijian childhood mortality rates: 1894-1939	141
Figure III-4	Deaths under 5 years/1000 births	141
Figure III-5	Stillbirth and neonatal mortality rates: 1894-1938	146
Figure III-6	Neonatal and post-neonatal mortality rates	146
Figure III-7	Infant and child mortality 1894-1939	148
Figure IV-1	Infant mortality rates 1923-54: direct and indirect estimates (Fijians)	159
Figure IV-2	Infant mortality rates 1923-54: direct and indirect estimates (Fiji-Indians)	159
Figure IV-3	Childhood mortality 1925-54: direct and indirect estimates (Fijians)	162
Figure V-1	Infant mortality 1946-76: direct and indirect estimates	206
Figure V-2	Childhood mortality 1946-76: direct and indirect estimates	206
Figure V-3	Childhood mortality 1946-76: indirect estimates	207
Figure V-4	Tuberculin reactors by age: 1950 and 1959 campaigns	238
Figure V-5	Trends in infantile diarrhoea and dysentery cases (Fijians)	243
Figure V-6	Mortality in epidemic years	249
Figure VI-1	Childhood mortality 1970-1986: direct and indirect estimates	280
Figure VI-2	Early neonatal and post-neonatal mortality: 1974-1986	280

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CHAPTER I

INTRODUCTION AND HISTORICAL BACKGROUND

1. Introduction

Gains in life expectancy in both developed and developing countries are one of the major social achievements of this century. The contribution of declining childhood mortality to these gains in all countries has been substantial. While reasonably good recent estimates of childhood mortality are known for most developing countries, there is considerably less evidence of good quality on long-term trends (Palloni, 1990 and 1991). Fiji offers a rare opportunity to study these trends in childhood mortality, mortality under five years of age. From the outset of British rule the Colonial Government was concerned with depopulation, a concern which became focused on the large proportion of infant and child deaths relative to all deaths and the very high infant mortality rates. The need for an accurate system of vital registration and regular censuses was clearly recognized. Considerable documentary evidence remains which reflects the perceptions of those in government as to the causes of the high levels of morbidity and mortality. In today's terms the Colonial Government was "pro-active" in initiating public health and medical programmes and, in most cases, these are relatively well documented.

This thesis describes the trends and levels in childhood mortality from the time of cession of Fiji to the British in 1874 through to the most recent census in 1986. The aim is to contribute to an explanation of the decline in mortality with special reference to the role of the Colonial Government. The core, and more detailed, analysis, covers the period from 1893 -- when the first major inquiry into the decrease of the population was carried out -- to the late 1960s when relatively low mortality was reached. Only Fijian¹ childhood mortality is examined. The immigrant (at first indentured) Indian population, which by the 1940s was of equal size to the Fijians, did not benefit in the same ways as the Fijians from the benign paternalism of the British. Theirs is a different story.²

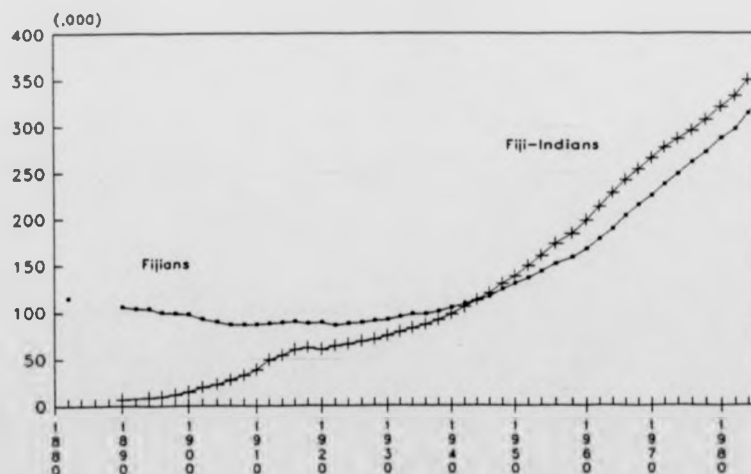
Fijian infant mortality rates for the late 1880s, based on government reports, averaged 383 per thousand births.³ A century later, 1985-1986, the average was 19. Over this period the Colonial Government, and after 1970 the Government of independent Fiji, initiated many public health initiatives in the form of

sanitary programmes, medical provision in hospital and in villages, vaccination and (later) immunization programmes. A central question addressed here is the importance of the contribution of government programmes to the reduction in child mortality. Relatively low mortality, IMRs of about 40, was achieved by the late 1960s -- within the colonial period.

The growth in the numbers of the two main component groups in the population was closely watched by the Government. An increase in numbers of even a few hundred Fijians was applauded in the early years of the century. Later the increasing numbers of Fiji-Indians -- from lower mortality, higher fertility and immigration -- would cause concern both amongst Fijians and in the Government (see, e.g. Lambert, 1938; Lal, 1992; Hull and Hull, 1972). Figure I-1 shows the population growth of the two groups between 1881 (the first census) and 1986 (the most recent census).

Figure I-1

Population Growth
1881 to 1986



Recent conceptual work on mortality in both developed and developing countries, to which the work of Mosley and Chen (1984) has contributed, has resulted in a change in the perceived causal locus in explanations of mortality (see also Ruzicka, 1989, and Hill, 1985). Today an appropriate conceptual framework must take account of the many largely time-ordered ecological, social, cultural, individual and pathological variables which affect survival. This is in contrast to simpler bio-medical models which centred on the more immediate biological consequences of specific diseases. Thus, the move has been away from death seen as a narrowly time bounded event described by an acute, largely single, cause towards death as a process involving multiple factors whose effects occur over time. The latter is more closely linked to the study of chronic diseases. Particular attention has been focused on the "proximate determinants" which mediate between the larger cultural and social factors and pathological processes. These differ in the conceptual frameworks of different investigators (Mosley and Chen, 1984, Hilderbrand, 1985, Basu, 1989, Landers, 1992).⁴ And similar conceptual frameworks are aimed at different levels of analysis. For example, the work of Landers and colleagues (1992) is "pitched at the level of population variations rather than that of individuals or households."

The elaboration of bio-medical models of mortality to include socio-economic variables is not as new as the frequency of citations to Mosley and Chen in recent research on mortality would suggest. As Kunitz (1987) has shown, explanations of mortality and the conceptual frameworks which structure them change as professional and political values change. The Harvard epidemiologist John Gordon (1952), writing of the post-World War I period, noted then the awareness that "cultural, economic and social factors are important determinants of health and diseases in groups of people" and saw "a return to a 'holistic' interpretation of community diseases". He wrote:

Opinion solidified, to give general appreciation that there is no single cause of mass disease, that causation involves more than the agent directly giving rise to the process, that cause lies also in the characteristics of the population attacked and in the features of the environment in which both host population and agent find themselves. The result is the modern concept of epidemiology as medical ecology and of disease as an ecologic process (pp.115-116).

The Colonial Government in Fiji adopted this "holistic" approach to public health through most of this century. However, consensus that it is a dense "web of causation" or a complex "causal chain" which determines the levels and age patterns of mortality as well as the specific disease patterns has been accompanied by the realization that "only small portions of the posited causal chain [or presumably web] can be profitably examined at one time (Hilderbrand et al., 1985)". Small scale, more carefully controlled, designs have been one solution to attempting "to unravel the whole complex of reasons for the observed level of child mortality in a population through a single study". Their study of child care among the Delta Tamsheq and the Fulani of the Seno-Mengo in Rural Mali is one example. Similarly Basu analyses the effects of culture and status on the demographic behaviour of North and South Indian women living in the same area of a Delhi slum "...almost a laboratory situation as far as the external physical environment as well as the theoretical access to services and opportunities...(Basu, 1989)".

This analysis is at the opposite end of the spectrum of methods of assessing and explaining mortality. We ask in relation to a society over a long period what can be learned from admittedly deficient data on long-term trends in childhood mortality, using the limited available explanatory evidence. Dyson and Murphy (1991) have called for greater attention to "the huge mass of demographic time series material which exists and has been unduly neglected" for developing countries. This relative lack of attention is undoubtedly due to known deficiencies in vital registration data. But it is also a likely consequence of the relatively recent research on child mortality, referred to above, which underscores the complex explanatory frameworks necessary for interpreting mortality patterns; frameworks which require knowledge of the interrelations of economic, social, individual and bio-medical factors. The data requirements for these explanations become increasingly daunting.

While the data on trends are important in their own right in establishing the timing of mortality transitions at the aggregate level, explaining changes in levels and patterns of mortality in developing countries has proven more difficult. In part this is because attempts to link historical and anthropological evidence for developing countries with demographic evidence are limited. In part, also, explaining

mortality trends in some developing countries and for some populations is likely to involve exploring data sources not typically used by demographers -- government reports, ethnographies, letters and memoranda. This thesis attempts to develop an explanation of trends in declining mortality using these sources and asks how far we can progress with them.

The analysis presented here does not start from an explicit explanatory framework from which hypotheses are derived. However, it is informed by the theoretical work of many others, such as Mosley and Chen (1984) and more recently Murray and Chen (1993). There is, therefore, an implicit explanatory framework which is considered in the analysis for each time period. Declining mortality has been argued to be the result of increasing standards of living including levels of nutrition (e.g. McKeown, 1976; McKeown and Brown, 1955; McKeown and Record, 1962; McKeown, Record and Turner, 1975; Palloni, 1990); modern medical and health technology (e.g. Preston, 1975; Meegama, 1968; Grey, 1974); public health initiatives (e.g. Szreter, 1988) including the development of a medical infrastructure; personal illness control and hygiene (e.g. Ewbank and Preston, 1990; Basu, 1992); socio-cultural factors (e.g. Caldwell, 1986; Basu, 1992) including women's status and autonomy, but especially maternal education (e.g. Cleland, 1990). These determinants have been considered here for all the time periods into which the analysis is divided, although the analysis is, of course, limited by the documentary evidence which is available.

In the absence of other quantitative trend data there is no time series analysis which -- using the language of multivariate analysis -- would allow us to "control for" some of the variables believed to affect mortality, such as trends in education, in real wages or in food prices. Indeed there are no data on specific causes of death. But there are Annual reports on diseases present in the Colony and epidemics are fairly well documented.

Some of the important mortality determinants are indirectly "controlled", which simplifies the analysis in some time periods. Fijians lived in rural areas until the 1950s, when only a small minority began moving to towns. And it was the policy of the Colonial Government to provide decentralised health services throughout the Colony. The Fijian culture was a conservative one, and change in many customs, even though feared, was slow.

This included the kinship system, the importance of communal obligations and exchange, and the authority of the chiefs (Ravuvu, 1983 and 1987). There was sufficient food and there were no famines. There was and is therefore a nutritional floor, although it is argued here that the weaning diet was a poor one. The disease environment was less complex than that in many developing countries. Cholera, for example, was unknown and Fiji is non-malarial. The level of literacy in Fiji had been high from the beginning of this century (perhaps earlier) among both men and women, and schools existed from the late 19th century even in remote areas.⁶ Fiji suffered from no wars after cession apart from the indirect effects of World Wars I and II. There have been no religious or tribal conflicts among Fijians. These and other factors are discussed in the following chapters.

Situating this study within the large and varied child mortality literature on developing countries is not easy. There are very few demographic studies which describe public health initiatives in detail as is done here (exceptionally see Meegama, 1968). Although political will is identified as an important factor in achieving low mortality (Halstead et al, 1985; Caldwell, 1986), there are few detailed analyses of the demographic effects of government policies on childhood mortality. And while the health policies of colonial governments play a significant role in the study of colonial medicine, the analysis of their demographic effects is limited (see, for example, Vaughan, 1994; Lyons, 1994; Thomas, 1990; Arnold, 1986). On the other hand, the demographic analysis of mortality trends in developing countries generally gives a limited airing to colonial health policies (see, for example, Palloni, 1990; Preston, 1980).

Analyses of trends in childhood mortality in developing countries have multiplied considerably in the last two decades as a result of the World Fertility and Demographic and Health Surveys (WFS and DHS, respectively) and the development of indirect methods of estimating mortality. These different analyses can be distinguished by their sources of data and their methods of analysis (see Palloni, 1991), as well as levels of analysis and concern with mortality differentials. Some illustrative analyses are briefly described in Table I-1. The maternity (birth) histories used in the WFS and DHS provide some information on mortality trends and the age pattern of mortality

for about twenty years before each survey, where there is a full maternity history, although the estimates for earlier periods are based only on births to those then younger women (i.e. women ages 40-49 at the time of the survey) and are therefore biased. This methodology is now more used more generally.

Table I-1
Illustrative Demographic Analyses of Trends in Childhood Mortality

Author	Country	Source of data	Measures	Series
(A) Brass and Jolly 1993	Kenya	census/ survey/ maternity history	CEB-CS/ direct life table analysis	1945-80
(B) Feeney 1991	Sarawak Malaysia	census	CEB-CS	1935-70
(C) Timaues 1984	Lesotho	WFS/maternity history	CEB-CS/ direct life table estimates/ component rates	Mortality rates for 5 year periods before 1977 from 0-4 years to 20-24 years; CEB-CS based on household survey
(D) Kunsta- dter et al. 1993	Hmong people in Thailand	survey/26 communities/ maternity history	Direct life table estimates/ component rates including fetal mortality	Mortality rates based on 5-year birth cohorts 1956-86
(E) Pison et al. 1993	Miom area, South Senegal	census/ multi-round surveys/ maternity history	Direct life table estimates/ component rates	Mortality rates based on 5-year birth cohorts 1930-84 (small Ns before 1945)
(F) Bicego et al. 1991	Haiti	census/ survey/ maternity history	CEB-CS/ direct life table estimates	Mortality rates 1960-90
(G) Mandle 1970	British Guiana	Vital registration	IMR unadjusted.	1911-60
(H) Guha 1993	India	Vital registration	age- specific death rates	1863-1920
(I) Bucht and El Badry 1986	Egypt	Vital registration/ survey/ census	IMR unadjusted; IMR adjusted by CEB-CS for census years; CMR*	IMR 1910-80 Cairo/ other measures for census years only.
(J) Langford & Storey 1993	Sri Lanka	Vital registration/ census	IMR unadjusted; CMR* for census years	1921-81 Census years

Table I-1 (continued)				
(K) Meegama 1968	Sri Lanka	Vital registration	IMR unadjusted	1924-49 (estates only)
(L) Diaz- Briquets 1981	Cuba (Havana)	Vital registration/ census (Havana)	Death rates including 0-1 for census years	1901-53
(M) Palloni 1990a	Latin America	Vital registration/ census/ 22 countries	IMR unadjusted IMR adjusted -- procedures unspecified	1910-80 unadjusted rates for some countries/ four patterns of mortality decline
(N) Halstead et al. 1985	Costa Rica Kerala Sri Lanka	Vital registration	Sri Lanka IMR 1920-80 Kerala & Costa Rica partial series IMR 1920-80	
(O) Hill 1985	Mali	survey/ maternity history	CEB-CS/ direct life table estimates/ component rates	1965-80

* Three-year averages centred on each census year.

The development of indirect methods of estimating childhood mortality, especially the Brass CEB/CS method (Brass, 1968), from the cumulated numbers of children ever born and surviving, based on both censuses and surveys, has provided data on mortality trends in most developing countries. Where these estimates can be chained together over several censuses, as is possible in Fiji, they provide an important source of time series data (See Table I-1, A,B). Such estimates are important in their own right and for evaluating and adjusting vital registration (see, for example, Table I-1, F).

While parish records have been an important source of data on mortality trends for some developed countries, especially for England (Galley, 1994; Wrigley and Schofield, 1983), giving childhood mortality estimates over very long periods, this source has not yet been seriously exploited for developing countries. (However, see Palloni, 1981). Equally there are relatively few long series of childhood mortality estimates for developing countries based on vital registration (G-M). Latin American countries have provided some series of variable quality (see M). There are trends of good quality for Sri Lanka (see J,K,N), Kerala (see N) and Costa Rica (See N). There are so far few analyses of long-term trends in sub-Saharan Africa, but see Table I-1 (A) and Hill (1993).

Maternity histories provide direct life table estimates of infant and child mortality, as well as estimates of mortality at other ages.

They are the best sources of data on the age patterns of mortality, and on mortality differentials at the individual level. Vital registration provides age specific death rates either alone or in combination with census population estimates of the mid-year population. Analyses using these different measures are outlined in Table I-1. All of the measures are used here, although the core analysis depends on vital registration until WWII and both vital registration and indirect estimates thereafter.

Much demographic research on mortality in developing countries (as exemplified by the studies in Table 1-1 and see also, for example, Preston, 1975, and Preston, 1980) is carried out with little regard for the social history of the country or area of attention. There are notable exceptions, for example Meegama (1968) analyses public health initiatives and government policies in some detail; see also Guha (1993) and Pool (1991). The new interest in "Health Transitions" has encouraged a multi-disciplinary approach to investigating health problems (e.g. Caldwell et al., 1990, and, for the U.S., Ewbank and Preston, 1990; Preston and Haines, 1991).

The present study, in contrast to most recent demographic research on child mortality, brings demographic methods to bear on the social history of childhood mortality in Fiji, thus attempting to combine the two quite different styles of analysis. Here the focus is on trends, levels and age patterns of childhood mortality pitched at the aggregate level. But in the absence of quantitative explanatory data on trends we examine the probable social determinants using more qualitative historical sources of evidence. As this is a first account of these trends in Fiji and as there is, as yet, no comprehensive history of public health for Fiji, the analysis is both exploratory and largely descriptive.⁷

Recent research on the proximate determinants of mortality at the individual level also motivates the questions which are asked to explain the mortality decline in a particular period or over time. The importance of, for example, maternal education, personal hygiene, relatively long birth intervals and the duration of breastfeeding as determinants of mortality is now well established. Where there is relevant evidence related to these proximate determinants it is described.

Section 2 of this chapter describes the geography of Fiji (note: maps are found after Appendix C at the end of the thesis). Sections 3-5 give an historical background, including the Inquiry into the Decrease of the Native Population, which lays the ground for the analyses in subsequent chapters. Chapter II reviews the sources of data and measures of childhood mortality used in the thesis; it includes a brief history of the censuses, a description of the system of vital registration, an analysis of the completeness of vital registration,

and an evaluation of the Brass method of indirect estimation of childhood mortality in the Fijian context. Chapter III describes levels and trends in childhood mortality and government health initiatives from the end of the nineteenth century to 1927, the beginning of the Child Welfare Campaign (CWC). Here the pathological environment and the probable causes of death of children are described. This is the only period for which there are regional mortality estimates. Chapter IV is a description and evaluation of the CWC. Chapter V, the longest and most complex chapter, describes the post-World War II public health initiatives and the "route to low mortality" in Fiji with reference to Caldwell's model of mortality declines (Caldwell, 1986). This chapter looks in detail at public health initiatives in relation to specific diseases and conditions within the post-WWII social context. Chapter VI comprises a "postscript" which brings the analysis of mortality estimates and health-related programmes from Fiji's independence to the last census of 1986, and some conclusions.

2. Geography

Fiji, a British Colony from 1874 and an independent country from 1970, consists of some 300 islands in the south-west Pacific Ocean. Of these, about 100 are and have been inhabited over the period of this investigation. They lie between fifteen and 22 degrees south of the Equator (the latitude of Zimbabwe and Bolivia), about 1750 miles north-east of Sydney and 1150 miles north of Auckland. The islands are scattered over almost 250,000 square miles, of which only 3% is land area. The largest island, Viti Levu, covers 4,011 square miles and accounts for over half of the land area of the group (see Map 1)⁹. The second largest island, Vanua Levu, is about half the size of Viti Levu. Except for the islands of Taveuni and Kadavu, each about 160 square miles, the remaining islands are small and are usually identified in three groups: Lomaiviti (central Fiji) includes Gau, Ovalau and the islands of the Koro Sea; the Lau group includes numerous small islands in Eastern Fiji and the Yasawa Group lies to the north-west.⁹

The main islands are volcanic in origin. Viti Levu has broken mountainous inland terrain with few large cultivable stretches except in the river valleys, some of which are highly fertile. Most villages on the main islands are located along the river valleys and along the coast. Villages were small at the time of cession to Britain and, despite some efforts by the Government to consolidate them, remained small. The 1891 Census showed 1398 villages, 78% of which had a population under 100. In 1921 the number was 1099 of which 83% had fewer than 100 inhabitants. Throughout the period under investigation the majority of the Fijian population has lived on Viti Levu. The first reliable Census in 1891 reported that 57% of the Fijian population lived on this one island.

The climate is tropical maritime, influenced by the trade winds, but there are pronounced differences between the windward (eastern) sides of the main islands, which have high rainfall (300 cm. annually in the capital Suva in the south-eastern corner of Viti Levu), and the leeward (western) which are dry. The smaller islands have sharply distinguished dry (winter) and wet (summer) seasons. All the islands are prone to destructive cyclones.

3. History

3.1. Pre-session

Current archaeological and linguistic evidence suggests that Fiji was first inhabited about 3,500 years ago by people with the same culture as those who went on to Tonga and Samoa and became the ancestral Polynesians; at times over the next 2,500 years there were further incursions of Melanesians from the west, producing a culture which owed much to both. However, as Routledge (1985) writes,

More important than external antecedents and affiliations, perhaps, was the independent development of Fijian culture and its complexity..... resulting in a failure [on the part of some] to take account of the fundamental heterogeneity of the Fijian people and their culture."

For example, the people of eastern Fiji, and particularly the Lau group of islands, remained much more heavily Polynesian in custom, and had many links of marriage and settlement (and warfare) with Tongans.

The first European sighting of the islands was in 1643, but there was no landing until 1791, and no systematic trading until the first decade of the 19th century (sandalwood), followed by the beche-de-mer trade which reached its peak in the 1840s. Settlement began in a desultory way in the 1820s, and by 1870 there was a European population of more than 2000. The first missionaries had arrived from the east in 1835, and conversions in large numbers took place after the mid-1850s (Garrett, 1982).

The middle decades of the century were characterised by fierce warfare between Fijian chiefdoms, exacerbated by the introduction of guns. There was also considerable friction with the settlers, themselves divided between planters and merchants, over land and labour. In 1858 the first of several offers by Fijian chiefs to cede sovereignty to Britain was refused, but eventually, after several unsuccessful attempts at a functioning national government under chiefly leadership, it was accepted in 1874, and Fiji became a British Colony. There were, however, many elements of continuity. The pre-colonial national government had already begun the system of **Bulis**, Fijian officials with powers at **tikina** (district) level, and had appointed provincial governors, "with an authority derived from and coinciding to a large degree with the traditional chieftains....[who] were in function, and in many cases in identity, the predecessors of the **Roko Tuia** [native provincial officers] (Routledge, 1985)".

3.2. The early colonial period

The health of a population under a colonial administration depends critically on the policies of the colonial power in choosing between its own interests, those of the settlers, often its own nationals, and those of the local population. Fiji was a rather rare case: Britain had taken power at the repeated request of the Fijians, and on the understanding that their welfare was to be protected. The first Governor of the Colony of Fiji, Sir Arthur Gordon, described as "outstanding among British colonial governors of the nineteenth century" arrived in Fiji in 1875, having previously been Governor of Trinidad and Mauritius (Lal, 1992).¹⁰ In his first address to the assembled chiefs he reminded them that "the Queen did not really wish to annex Fiji... but believed that it would be right to do so....in order that you should be cared for and led into the proper path (Gordon, 1912, Vol 1, 210)". His perception of his mission, which was to be the most important influence on government policy for the next several decades, was to preserve the people and culture of Fijians against political expediency, European settlers and to some degree themselves.¹¹ From time to time he felt the need to remind the Government in London (usually at some length) that its policy and his was to make "the welfare of the natives ... the object of my constant solicitude (Gordon, 1912, Vol 2, 163)". This mission included the support of policies and regulations "vexatious" to the European settlers and labour policies which would make the Colony dependent on indentured labour from the Pacific and India.

The question "How can a large native population be governed by a handful of white aliens?", especially given London's clear message that money would be limited, was answered by Gordon's development of the system of "indirect rule", later to be taken up by Lord Lugard and others in Africa. The object was:

to seize the spirit in which native institutions had been framed, and develop to the utmost extent the capacities of the people for the management of their own affairs, without exciting their suspicion or destroying their self-respect....to maintain in authority the local chiefs, and in all possible ways to utilise the existing native organisation (Gordon, 1883, 713).

A hierarchy of native Councils already existed, from the Great Council of Chiefs, which "more or less roughly, represented the whole of Fiji" down to the District Councils, which included among their duties the "discussion and regulation of all local matters, such as the cleansing and scavenging of villages (Gordon, 1883)".¹² These councils, along with the administrative officers, **Buli** and **Roko**, and the native magistrates were the essential constituents of the native administration.

It was Gordon's belief that such a system, along with policies which protected Fijian land and labour and which created an appropriate

system of native taxation, would make it less likely that the Fijians would "perish from off the face of this earth (Gordon, 1879)". Fears about the decline in population were always a heavy preoccupation. In 1877 he wrote anxiously to his friend Lord Selbourne that "A change at the Colonial Office or a change here might bring into play forces which would very quickly exterminate the native population (cited in Heath, 1974)".

Gordon had arrived in Fiji in the year of a catastrophic measles epidemic. An estimated 40,000 people, some quarter of the population, had died. This, coupled with the mission to make Fiji an exception to colonial depopulation and dispossession, made concern with monitoring the numbers and health of the population of central importance to the Government (See Heath, 1974). A system of vital registration was established in 1877 which made such reporting, its accuracy and outcomes, the responsibility of the native Fijian administrators, especially the **Bulis**. Their close ties to the villages under their administration meant that a relatively complete vital registration system was established from the beginning. Just before his departure, Gordon wrote to the Secretary of State that "whether the population is now decreasing or not is, to say the least, now a debatable question (which it never was before)". Reflecting in the same dispatch what would be a continuing concern with infant feeding on the part of successive governments, he commented that "there is little proper food for children, and I have no doubt much mortality is caused thereby (dispatch of November 8, 1880, in Gordon, 1912, Vol.4, 491, 493)". Four days later, in his farewell address to the Council of Chiefs, he urged them "very seriously to consider the large number of deaths, especially among children" and suggested to them that "means be taken to provide cow's or goat's milk for children too old to depend on their mother's milk, and too young to eat the food of grown-up persons (Gordon, 1912, Vol 4, 502)".¹³

Gordon was succeeded as Governor by Sir George des Voeux, under whom his policies were continued. Four years later, he was in turn succeeded by Sir John Thurston, right hand man to both of the former two Governors, and a long-standing Fiji resident who had played a prominent part in negotiating the Cession. He was described by Gordon as "a peripatetic encyclopedia to the past in Fiji (Gordon, 1912, Vol 1, 184)". He remained Governor till his death in 1897.

3.3. Vital statistics.

The quarterly reports and annual summaries from the vital registration system were closely watched by the Government. By 1887 there had been eight annual reports on "Vital Statistics of the Native Population". The crude birth rates (based on the 1881 census) were consistently between 35 and 40, but fluctuating and high death rates indicated an overall population decline. The higher than average death

rates were at first attributed to epidemics: whooping cough in 1884, dengue and influenza in 1885 and 1886. Des Voeux wrote in his memoirs of the constant fear that "the first inroad of epidemic disease would cost the loss of more than all of the small increase of population gained...The mortality of infants was enormous..."; he used this as the basis of an unsuccessful bid to London for money to pay more European staff, especially doctors. Its rejection, he wrote, did an "irremediable injury" to Fiji (Des Voeux, 1903, Vol 2, 23).

The accumulation of information centred attention on the levels of infant and childhood mortality. The reported rates of infant mortality for the years 1881-1887 caused considerable alarm among the colonial administrators. The average recorded rate of mortality for infants under one year per 100 births was 44. This was later contrasted with an average rate of 14.4 for England in the ten year period 1880 to 1890. The contribution of infant and child mortality to all mortality in the year 1886, for example, was shown as follows: 14.6% of all deaths occurred to infants under one month, 22.6% to infants between one month and one year, and 12.4% to other children. Further analysis of the Vital Statistics Reports for 1887 and 1888 shows similarly high proportions.¹⁴

After the 1891 census, the decline in population numbers was undisputed, although there was disagreement about the rate as a result of different views on the completeness of the censuses. In the decade from 1881 to 1891, the decline was first estimated at about 8%, subsequently revised downwards to 4%.

Concern about this was apparently not generally shared by the Fijian chiefs. In his memorandum transmitting the eighth annual report on the Vital Statistics of the Native Population, 1887, James Blyth, Secretary for Native Affairs, reported

The subject of the decrease of the native population was not brought before the Council of Chiefs.. last month because it has been found that discussion of it at former Councils has ended in perplexing rather than enlightening the representatives of the people. They had been told frequently that the principal causes must be found in the sanitary conditions of the villages and in their want of care for the young, the aged and the sick, but whilst they have candidly admitted that these are causes, they are not convinced that they are the sole causes....In private the chiefs state their opinions frankly but in their public meetings they do not bring them forward...They feel that the explanation is to be found in the change in their social relations, and they are in danger of quietly accepting the result as inevitable (CO83/46).

Some of the changes in social relations are discussed below in Sections 5.1 and 5.5.

3.4. The Inquiry into the Decrease of the Native Population.

In December, 1891, a circular was published by the Government in Fiji inviting views on the matter. It stated that, on the basis of its 1888 Resume of the Vital Statistics of the Native Population "the

decrease of the native population is due to the phenomenal rate of mortality among infants" and that it was this rate that had to be reduced. The six page circular presented the available statistical information in some detail.

In his dispatch of 12 April 1892 (CO83/55), Sir John Thurston informed the Secretary of State of the investigation of these matters which he had initiated, and in relation to the decrease reassured him that "the subject still occupies the close attention of myself and advisers". He reported the Government's conclusions in advance of the investigation. If infant mortality could be brought down to "a normal ratio" the problem of population decrease would be solved. It was, he reported, his own opinion that the chief cause of the high infant mortality was "the callous indifference of the mothers of the children". "After nearly thirty years of close observation of the Fijian people", he averred, "Fijian women have the maternal feeling and instinct less developed than the women of any other race".

The same dispatch and its accompanying material also, and more analytically, shows the size of the effects upon population decrease of the epidemics of the previous decade, including a graph to show small population increases during the few epidemic-free years. This analysis (by Basil Thomson¹⁹) shows that whooping cough, dengue fever, influenza and dysentery resulted in an estimated excess of 4598 deaths over births in the 10 year period. However, of the "fluctuations of increase and decrease" during the decade he concludes that "whenever the natives are free from epidemics or are better able to cope with them, their numbers will not decrease".

The contrast between these two different types of observation (i.e. Thomson's and Thurston's) reflects the differences in approach within the Colonial Government to the question of the decrease in general and childhood mortality in particular. While some in the administration wanted a meticulous analysis of numbers, customs and practices which would inform policy, others wanted a relatively speedy report that would apportion blame. As in Gordon's day, officials were defensive on the subject; while conceding that the population problem was serious, they felt at pains to show, in Thurston's words, that the decrease was still lower than it had been 25 years before (i.e. before cession) when "the subject first attracted [my] attention." This view was bolstered by missionary evidence based on reports from the 1860s which were included in the government circular and which accompanied Thurston's 1892 letter. This evidence, based on the Rev. Lorimer Fison's "anthropological" work, states that "the Fijians were decreasing in number before the earliest white settlers came among them and ... long before the group was annexed" and that he saw "no reason to believe that the rate of decrease is any greater now (1881) than it was then." Thus the circular concludes, even before it begins its

analysis, that the high mortality is "not due to any new influences arising out of the establishment of settled authority over the islands."

The circular was widely distributed. Thurston felt at pains to demonstrate the breadth of the inquiry to London, "I have felt that it would be proper to adopt every means of obtaining information and suggestions, if they had any to impart, from persons unassociated with the Government of the Colony, and more especially from such persons as are known to be opposed to the government in respect of native matters." In addition he records that additional investigations were being pursued by "higher Officers of Government including Medical Officers and Magistrates of long standing in the service for years past."

The circular asked respondents to attempt to identify the "predisposing causes of this mortality" and "what remedies are practicable". There were 65 written replies, only one from a Fijian.¹⁶ However, seventeen Fijian informants were interviewed, among them several midwives. Informants from Tonga, Samoa and the Gilbert Islands were interviewed to give a comparative perspective.

The inquiry involved a number of other types of investigation: a review of population statistics related to estimates of the size of the pre-cession population; a survey of 440 families to study the effects of consanguinity on fertility and mortality; an analysis of mortality from epidemics; medical investigations, including an analysis of the breast milk of a mother who was a heavy smoker to try to assess the effects of smoking on breast milk, and a medical assessment of the benefits and hazards of pre-masticated food for infants.

The Report is discussed here in some detail as it provides the basis for the health initiatives well into the next century. It also provides insights into aspects of Fijian life which will have contributed to the high mortality rate, as well as those which might today be considered good practice.

4. The Report of the Commission.

This evidence is reviewed in the 1893 "Report of the Commission Appointed to Inquire into the Decrease of the Native Population", published in 1896. The members of the Commission were James Stewart, Assistant Colonial Secretary; Dr.B.G.Corney, Chief Medical Officer; and Basil Thomson, Assistant Native Commissioner. Its full terms of reference were

to inquire into and report to me upon the causes suggested for the Decrease in the Native Population and the remedies proposed for checking such decrease in the replies to the Colonial Secretary's Circular of 30th. December, 1891, and generally to report upon the causes which in the opinion of the Commission have led and still lead to a decrease of the Native population, and what remedies can be applied to check the decrease.

(Pages in the Commission's report will be cited here as "Rp", and it

will be referred to as "the Report" or "The Decrease Report". "The Commission" refers to this Commission.)

The Report asks the question "What are the 'predisposing' causes of infant and childhood mortality?"; the same question which the analyst of mortality wants to ask of the historical record. The evidence from the Report offers answers to this question from the perspectives of both the Europeans, including the Government, and the Fijians themselves, although this evidence is more limited.

The Report comprises 381 pages, including 144 pages of appendices. Each page is 300cm by 200cm of single spaced small print, amounting to some 375,000 words in all. The structure is as follows: a brief introduction, a review of population statistics, and then a section on each alleged cause of the decrease of the population. Each section follows a common format: a review of the evidence from submissions to the committee, a minute summarising and evaluating the evidence and adding other expert evidence, including comparative analysis based on other usually Pacific Island cultures, and proposed remedies.¹⁷

The Report's value is enhanced with hindsight, informed as it now can be by more recent epidemiological, medical, anthropological and demographic analyses of child mortality in developing countries. Few risk factors for early childhood mortality which this present research has discovered were not considered by the Commission. Among those factors which are analysed are: birth and breastfeeding practices, child nutrition, the status of women and their health, age of marriage, consanguinity, the effects of women's work on breastfeeding and child care, length of birth intervals, sanitation, diarrhoeal diseases and other diseases of children, epidemics, and the interaction of disease and nutrition.

Several of these determinants are examined below as they help to explain the very high childhood mortality rates in the late 19th century, a period without famine or food shortages, and they set the context for the latter analyses. These include the condition of women, the Fijian diet, breastfeeding practices and the pathological environment.

5. Some Contributing Factors to High Childhood Mortality in the late 19th Century: Colonial and Fijian Perceptions

5.1. The condition and status of women

5.1.1 Women's work

The Report, as a whole, shows that those making submissions to the Commission, and the Commission itself, recognised the importance of the "condition" and status of women as these affect both fecundity and child survival. In addition to a section devoted solely to these conditions, references to the everyday lives of women in regard to their health, nutrition, child-rearing practices and an often heavy work burden are woven into many different analyses. The modernity of these analyses is, however, mitigated by observations on the ignorance, insouciance, and fecklessness of native women.

The descriptions of the conditions under which women lived, worked and raised children were generally agreed between the Commission and those making submissions to it. There was considerably less agreement as to what could be done by the Government to improve conditions, especially as they affected child survival. Few dissented from the view that "The real question is 'Can the mother be won over to care for her child, to do her best to rear it, and not to expect its death?' (Rp40)".

Nowhere is there a definition of what is meant by the "status", which some hoped would be raised. That part of status which is derived from rank, i.e. ascribed status, was not the focus of attention, nor was achieved status, derived from some marriages and/or the acquisition of particular skills and knowledge. The aim of the more enlightened spokesmen of both the Government and the Christian missionaries was a shift in the Fijian perception of the value of common women in their own right, and especially in their roles as wives and mothers.¹⁸ By changing some of the conditions under which women lived and by continuous reminders of the importance of good child rearing skills it was hoped that such a change in status could be achieved.

The harshness of the lives of many women is documented in the earliest writings on Fiji and continues with common themes to the writing of the Report itself, although everyday lives of women are less fully recorded than the colourful ceremonies of birth, rites of passage and death which so intrigued early ethnographers and anthropologists. All of these sources describe the heavy work burden of many common women, and form a consistent picture of their lives over nearly 40 years.

The observations in the ethnographic accounts, while not as detailed as those that follow from the Report, confirm the picture presented in it:

Women, indeed, are regarded as a sort of property, ...nevertheless, although not an article of trade among themselves, woman (sic) is fearfully degraded in Fiji. In

many parts of the group she is as a beast of burden not exempt from any kind of labour, and forbidden to enter any temple: certain kinds of foods she may eat only by sufferance and that, after her husband has finished (Williams, 1858, 168-169).

The women of Fiji are little better than beasts of burden, having to carry heavy loads, do actual field-work, go out fishing and besides, attend to all the domestic arrangements devolving upon their sex in other countries (Seeman, 1862, 237).

The girls all learn to bear heavy burdens from a very tender age. It is remarkable how they manage to negotiate the steepest and most rugged of mountain tracks bearing enormous loads of yams, taro, wood and the like on their backs...Married women are rarely idle...The men, on the other hand, give themselves a lot of leisure...Even when at a very advanced stage of pregnancy the women work very hard about the house and go on long treks across both valleys and mountains (Kleinschmidt, 1878).

Observations similar to those of ethnographic accounts continue in the Report:

Fijian women, being from ancient tradition and practice regarded as mere chattels and slaves, submit to a life of hardship and hard work (Rp38).

Young women who appear strong and healthy marry, and in the space of a few years become 'broken down old hags' (Rp38).

However, submissions to the Commission on the condition of women had a number of different foci. Some were comments on the maternal qualities which Fijian women were expected to exhibit:

...the women spend all their time gadding about from house to house, idling, and gossiping, to the utter neglect of their children and their household duties (Rp41).

[They feel no personal responsibility or regret at the death of their children] ...Fijian women have a hereditary low moral standard, and no moral sense of responsibility (Rp40).

Other submissions were sympathetic to the harsh environment in which many women lived and its consequences for their children:

...pregnant women have still to carry heavy loads of firewood and water and to fish. Special emphasis is laid on this statement (Rp39).

Men show an utter disregard for the condition of their women in all stages of pregnancy and child-birth (Rp40).

...being overworked the woman can neither give the attention nor the nutriment necessary for rearing her child. The care of her child is a burden and its death a relief to her (Rp39).

...fishing with hand nets used by women standing waist-deep in the sea, and... diving for shellfish at the bottom of tidal rivers ...In river fishing the women remain in the water for three or four hours in all weathers (Rp128).

Both men and women planted gardens, but the continuous tending of them and the gathering of food were, in many parts of the country, largely the work of women, and gardens were often at some distance from

the villages. In addition, attempts in the drier parts of the islands to grow sugar cane and tobacco increased the level of agricultural work. That heavy staple foods and firewood were carried (often long distances) by women is documented not only in these written accounts but also in pictures and drawings (see for example, Brewster, 1922). While the more irregular deep sea fishing was carried out by men, the essential subsistence provision of fish was women's work in many areas. In rivers this could involve extensive periods of diving. Water also was carried, again, long distances, by women. The long cooking required for staples meant that large quantities of firewood were needed daily. Cooking, caring for children, and making nets, mats and other domestic articles such as cooking pots, essential to domestic life and for exchange, were also largely women's work.

The Commission accepted this picture of the work burden of many women. However, it also recognized that its extent differed by geographic area. The Commission summary of evidence argued:

A line drawn on the map through the Somosomo Straits towards the south-west, so as to separate Taveuni and the islands of Lau and Lomaiviti from the rest of the Group [see Map 1], would mark the eastern limit of the tribes whose women do field-work. Eastward of this line the great admixture of Polynesian blood introduced from Tonga where the women do no kind of severe outdoor labour, except fishing, has so far modified the customs of the natives of the windward districts as to exempt the women from the labour of planting food or collecting firewood... West of this imaginary line the women certainly do severe labour... In the western districts of Vitilevu and in Yasawa the men, after breaking the soil with the digging-stick, have little more to do. There the women hoe, plant, and weed the gardens, cut wood, draw water, and cook the meals (Rp41).

The Commissioners were reluctant to interfere in all areas of work and for all women. Women appeared to do their work willingly. European peasants worked as hard and without the benefit of the "robust frames" of Fijian women. Previous attempts to limit women's work, in the form of a Native Regulation of 1885 (Rp43), had failed to have any serious effect. Where women had a lighter burden of work (in the Eastern part of the country), it was argued that birth rates were no higher and stillbirth rates and infant mortality rates no lower.¹⁹ Proposals that would affect the work burden of women generally would have put the Government in direct conflict with Fijian men. "Once married, she cannot abandon field-work, as the men will not undertake it and without it she would starve (Rp42)".

Pregnant and breastfeeding women, however, attracted greater administrative attention. Submissions documented that in both conditions many women did both heavy field work and fished for long periods, although seafishing by lactating women was "forbidden by ancient custom" throughout Fiji. Fishing and carrying heavy loads of firewood are described as the most injurious forms of labour.

Women in Bua carry loads of yams of 80 or 90 lbs. weight, 6 or 8 miles, climbing and descending a range 700 feet high...The native opinion upon this subject is that steady work during pregnancy so long as it is unaccompanied by sudden shocks or severe strains, has an advantageous effect (Rp127).

While pregnant and breastfeeding women may have received the greater part of the attention of the Colonial Government, the fact that women's heavy work did not appear as a health factor in later reports suggests that informally through the chiefs, the churches, and medical workers norms and behaviour were, in fact, probably changing.

How important a contribution to infant and child mortality would a heavy work load for women have been? Several different effects are possible. They include: 1.) The direct physical effects of work on the health of a woman prior to and during pregnancy and in pregnancy outcome; 2.) Distinct from these direct effects, and perhaps of greater importance in the Fijian context, the conflict between the demands of breastfeeding and subsistence work. This might be seen as an indirect effect of work on mortality, mediated by cultural factors such as an alternative to the mother's provision of child care and an adequate alternative infant diet; 3.) The possible impact on women's willingness to carefully nurture infants in an environment which is already a harsh one for her and risky for her child. In such an environment, women may also seek to limit the number of their children by abortion and infanticide.

Historical research on comparative mortality rates in different social settings has shown that in geographic areas where women had a heavy work burden not only were infant mortality rates higher than elsewhere but so were abortion, stillbirth, and maternal mortality rates. (Kunitz, 1983 and 1990, reviews some of this research; see also Frieden, 1978). In the case of 19th century Eastern Europe, these IMRs (as high as those in Fiji at about the same time, although the social context was very different) were believed to be the result of the direct effects of work on the health of the women and newborn, along with poor breastfeeding practices, and the inability or unwillingness to keep children within the family.²⁰

More recent research in developing countries has shown that seasonal variations in workload can have substantial effects on the pregnant woman's weight gain, with very heavy work even resulting in weight loss (see for example Ebrahim, 1990; Jelliffe and Jelliffe, 1975; and on the effects of seasonal stress see Hilderbrand et al., 1985; Hill, 1985).²¹ Both historical and more recent research have shown the conflict between the demands of breastfeeding and both subsistence and paid work, resulting in a greater likelihood of practices which contribute to infant morbidity and mortality, such as the early introduction of solid foods and early weaning (Marshall, 1985; Frieden, 1978).

5.1.2 Changing customs in relation to family life

Summarizing the opinions of native informants, the Commission wrote that, apart from introduced epidemics, "natives attribute their decrease to the decay of their ancient customs in relation to women--a change brought about by the advent of Europeans and the abolition of polygamy" (Rp38). These changes in customary practices were in large part the result of the cultural demands of the Christian missions. The disbanding of polygamous households (in Fiji, nonsororal polygyny) was made a condition of Christian conversion, beginning with the chiefly families. While missionaries perceived the polygamous households as unstable and often violent, native respondents observed that women had been well treated, especially during pregnancy and while breastfeeding.²² There were larger numbers of women to share domestic responsibilities, and food and material resources would have been plentiful. Polygamy had, however, been practised by those of chiefly status and others with wealth and power. Thus the benefits of polygamy **per se** cannot be separated from those accruing as a result of living in high status, often chiefly, households. And the older, more senior chiefs, are more likely than others to have recorded their remembered past.

The Christian missions had the potential for more profound effects on infant and child welfare through their pressure on commoners to form Western style households, with men and women living, with their children, in one dwelling. These norms affected women of high and low status alike. Traditionally men, and boys after puberty, had lived apart from women and girls in the men's house - the **bure ni sa**. In most cases this was a usual practice, but always for a married man while the wife was nursing a child.²³ Sexual intercourse before a child was weaned was **tabu**. If a new pregnancy occurred while a woman was breastfeeding, the nursing infant would have to be abruptly weaned.

In the newly formed Christian households - the village model being the native teacher's household -- the husband and sons stayed in a small family **bure** rather than the larger and more communally oriented men's house. Fears about the consequences of these changes were shared by colonial administrators and some Fijians. Pregnancies would be more closely spaced, the period of breastfeeding shortened, infants abruptly weaned, and girls and boys would be in close and unsupervised contact. Government fears were summarised by Thomson (1908):

The mother is physiologically incapable of nourishing at the same time the foetus within her and the child at her breast...In many cases...death is caused by premature weaning owing to a second conception, but there is no doubt that a number of weakly children are brought in to the world through the physical incapacity of the Fijian mother for bearing healthy children in quick succession.

The separation of young men and women by the customary practice of sex-segregated housing had also, it was said, assured that pre-

marital sex and pregnancy had been rare. "Fijian girlhood was spent under the strictest surveillance. From puberty to marriage the girl was under the care of older women day and night (Rp38)." As reported to the Commissioners by "a woman of high rank and intelligence", "in these days...women are throwing off the old restraints, and they have not taken any new thing in their place. Pregnancy often enough follows upon this (Rp43)." The "club law" of the chiefs, which in some cases meant the death of wayward girls, and the ridicule which a non-virgin girl was subjected to when she married, had encouraged parents to be vigilant.²⁴ However, beliefs that only numerous acts of sexual intercourse would lead to pregnancy and that intercourse with more than one man would not will have contributed to the rate of illegitimate births. (See Quain, 1948; Thompson 1940b; and for another Pacific Island culture, Counts, 1985)

It is unlikely that pre- and extra-marital pregnancies were simply a result of decline in custom. The long periods of traditional post-partum abstinence coupled with the tolerance of sexual relations between *veidavolani* (cross-cousins) outside of marriage would have lead to extra-marital pregnancies in earlier times.²⁵ The tolerance which was generally shown to illegitimate children also suggests that there was no harsh attitude toward extra-marital sexual relations. However by attributing extra-marital pregnancies to the changes in custom brought about by the church, those with chiefly authority could distance themselves from the conflict between the sexual norms encouraged by the church and probable tolerance of these pregnancies when they occurred.

In their concern with the possibility of a rapid change in customs, both Fijians and some colonial administrators had identified several important risk factors of, especially, infant mortality. These included premature and abrupt weaning and short birth intervals. The greater Fijian concern about changing sexual practices probably reflected more general fears in respect of the rapid change of custom and the authority of chiefs than specific risks to mortality, although these changes too may have increased mortality rates. There is little evidence yet found on the fate of illegitimate children. Laura Thompson (1940b), in her work in Lau in the 1930s, reports that children "born out of wedlock were numerous."

While Western style households did become the norm, relatively long birth intervals appear to have been maintained. As late as 1974 when the Fiji Fertility Survey was carried out, only 15% of birth intervals were within 18 months of the previous birth, a period of greater mortality risk. (In sharp contrast, 33% of Fiji-Indian women had these short birth intervals.) Thus the fears of some in the Colonial Government that Fijian customs in respect of spacing would decline rapidly were not realised.

The relatively late customary age of marriage, and the delay in marriage resulting from the considerable goods which had to be exchanged before marriage, were thought by the colonial administrators both to increase premarital sex, with the consequent risk of abortion and illegitimacy, and to limit the total number of children women would have. Ignoring both customary practice and the arguments of the chiefs, laws favouring early marriage and restricting the obstacles to marriage were enacted. The perceived obstacles included the husband's marriage gifts (*yau ni kumu*) and the intervention of members of the clan trying to restrict marriages to those beneficial to the family or the community. As early as 1877 a Native Regulation had declared that a girl of 16 "shall be free to marry whom she pleases", but objections and interventions were nevertheless allowed. The Commission proposed laws to end these interventions (Rp116). These had little effect on the age of marriage which was fairly stable over the next century, as the next chapters show. These regulations were among many which would be largely ignored into the next century.

In the following section the possible effects of the work burden of women and changing customs are analysed in relation to a more proximate determinant of infant and child survival, breastfeeding practices.

5.2. Breastfeeding.

The Commission clearly recognized the importance for infant survival of what are now seen as good breastfeeding practices (Huffman and Lamphere, 1984). This is reflected in the considerable space allocated to this and related topics. The sections on "Lactation"; "Cohabitation of the Parents During the Suckling Period (*Dabe*)" and "Infant Diet" are long, tightly argued and rely on both native informants and informants from other Pacific Island colonies. Most early ethnographic sources make some limited observations on breastfeeding practices; the Report gives by far the greatest attention to them.

Breastfeeding began, in most cases, on the third day after the infant's birth (Rp141; Thomson, 1908; Deane, 1921), since colostrum was believed to be contaminated. This belief is consonant with those of some other indigenous Pacific cultures that such contamination comes either from semen or from menstrual blood (Marshall, 1985).²⁶ The newborn was given an emetic shortly after birth made from the juice of the candle-nut tree (*Aleuritis Tiloba*). During the first day the infant was fed juice from a coconut or plantain (roasted and chewed) or from sugar cane which was passed from the mother's or attendant's mouth to the child or on tapa which was given to the newborn to suck.²⁷ The infant was then, in some cases, wetnursed until the mother's breasts were "full", up to four days and sometimes longer (Rp141; Deane, 1921). Special care was taken with infants of high ranking mothers. "The

children of chiefs, in the old days, were usually suckled by more than one woman, and mothers of rank still receive similar assistance (Rp141)". Children of commoners were more rarely wetnursed if the mother was ill or died, but typically women were unwilling to breastfeed children other than their own (Rp143), and in most such cases the very young infant died.²⁸

Normal weaning began between nine and 18 months "or when three or four upper and lower incisors have come (Rp144)". Solid foods were introduced in the first few months, sometimes within the first few weeks. The length of the normal breastfeeding period was reported to be considerably shorter than was formerly the custom, in part as a result of the influence of the wives of native teachers who had been in the service of Europeans (Rp144).

Insufficient milk was reported as a common problem for Fijian mothers.²⁹ The causes of this insufficiency, uncommon today in traditional Pacific island cultures (see Marshall, 1985), are difficult to establish. The fact that the post-partum amenorrhoea of many women ceased between three and four months after the infant's birth (Rp144; Thomson, 1908) suggests that breastfeeding may have been either at infrequent intervals or of limited duration.

Fijian phrases related to breastfeeding support the perceptions of informants that insufficient milk was due in part to factors outside the mother's control and in part to poor breastfeeding practices and care. The Commission reported that

.... deficiency of breast-milk is a common circumstance to which Fijian infants are exposed ... many die from the drying up of the mother's milk "maca na mene sucu" [maca = empty, mene = nurse, sucu = milk]; or from "lodo i sucu" [a deficiency of breast milk].³⁰ The native witnesses...gave three explanations for lodo i sucu, when

1. the mother dies and the child is prematurely weaned;
2. the mother goes to work and suckles her child only occasionally;
3. the mother has plenty of milk and neglects to give it to the child.

The Commission concluded:

Part of the infant mortality from defective lactation would thus appear to be owing to the physical inability of the mother to provide the lacteal secretion and part owing to her pre-occupation and neglect....cases of drying up of the mother's milk would be much less frequent if the duties of lactation were performed in a more regular and less casual manner, and suffered less interruption from the calls of work (Rp142).

There were many pressures on women to shorten the duration of breastfeeding. Lactating women were prohibited from seafishing. Gardens needed continuous tending. Absences of husbands from the village to work elsewhere, though prohibited by law, were increasing. Fijian men were beginning to work on European plantations, and the tax burden, paid in crops, also required absences from the village (Lal, 1992;

Macnaught, 1982). However, some officials believed that the greatest pressure to shorten the duration of breastfeeding had come from the missionaries' belief that "the only perfect social system was to be found in the English mode of family life", and that this was reflected in their insistence on husbands and wives living together in one household. Equally, the missionaries' belief that the custom of abstinence was, in the words of one of their number, "an absurd and superstitious practice" set them in conflict with a custom that the more enlightened members of the government believed contributed to child survival (Thomson, 1908). Sexual relations while breastfeeding were still strictly proscribed within Fijian culture for fear of the contamination of breast milk and the resultant **dabe** (weakness) in the infant, even while customs separating men and women were no longer observed. Thus it was given to "public opinion to preserve the abstinence prescribed by ancient custom ... the health of the child is jealously watched for signs that the parents have failed in their duty (Thomson, 1908, 177)". These signs included frailness and weakness in the child and often an enlarged abdomen. It was believed that **dabe**, in turn, led to further illness for the infant and, frequently, death. However, the signs of **dabe** were the same as those of many of the diseases with which infants were afflicted. (The Report contains several sections related to **dabe**, its causes and consequences; see also Thomson, 1908.)

A number of the practices and beliefs related to breastfeeding are likely to have contributed to the high rate of mortality. The immunological and nutritional benefits which come from colostrum and early breastfeeding were denied to the newborns (Huffman and Lamphere, 1984; Marshall, 1985), increasing their vulnerability to intestinal viruses, diarrhoeal disease and bacterial infections. The introduction of liquids immediately after birth and the early introduction of premasticated foods would have increased the likelihood of contracting diseases from the carers as well as from unboiled water. The relatively long delay before breastfeeding would have added to the mother's difficulties in its establishment, and contributed to the difficulties found in some women in the expulsion of the placenta. The heavy workload of many women and the conflict between that work and breastfeeding would have led to a shorter duration of breastfeeding. Long absences from the infant due to work would also have affected the volume of breast-milk (Huffman and Lamphere, 1984).

Beliefs about **dabe** would increase the fatalism of mothers with a sickly infant. The term was extended pejoratively to the mother and the father: **tina ni vakadabedabe**, **tama ni vakadabedabe** respectively (Capell, 1984). These parents were much criticized and ridiculed. The fatalism in regard to the afflicted child may be reflected in the saying "**Sa vakareca na gone dabedabe**", said when "toil and effort seem

to be in vain (Capell, 1984)". The belief in the negative consequences of **dabe** coupled with abrupt weaning and a very poor infant weaning diet would often have brought about the deaths of young infants reinforcing the fatalism that existed.

5.3. Food and nutrition

The importance of a nutritious diet to child health and for the pregnant and breastfeeding woman was well recognized by the Commissioners. However, they lacked a clear picture of what this diet might be in a Pacific Island setting, relying instead on the European diet as a model. In particular the absence of animal milk and cereals from the diet was seen as a critical cause of undernutrition, as it would continue to be seen for the next sixty years. The abundance and variety of foods was of interest to early visitors to Fiji and is carefully documented. (See, in particular, Seeman, 1862 and 1873, but also Williams, 1858, and Kleinschmidt, 1878).³¹ This abundance has been rather romantically characterized as "subsistence affluence" (Fisk in Thaman, 1991).

However, this description does not altogether accord with that from the Report in respect of the nutrition of many women and young children:

All our native witnesses agreed in saying that famine is unknown in Fiji, and even in times of scarcity every native can procure enough... Our inquiries tend to show that the food of the adult Fijian is ample in amount and in variety, but that it lacks the important nutritive qualities possessed by foods rich in nitrogenous constituents, while there can be no doubt that it is quite inadequate for women during the periods of gestation and suckling, and for young children (Rp76).

In an environment with abundant food, or the potential to grow such food, what are the possible causes of under- and malnutrition amongst pregnant and lactating women, infants and children which are almost certainly reflected in the very high infant and child mortality? A number can be identified. These include a lack of balance in food groups, as a consequence partly of **tabus** ³² (which restrict essential foods), sex and age differences in food intake, food scarcities (although rare) and the weaning diet.

5.3.1. The food system at the time of cession

The Colony as a whole had been self-sufficient in food. There were exchanges in food which were especially important to the smaller islands within the group. Thaman (1991) has described the pre-European contact food system as a "highly diversified hybrid mix of domesticated and wild plants and animals, coupled with similarly diverse and sophisticated foraging and fishing strategies drawn from both Polynesian and Melanesian traditions". Numerous varieties of staple offered "diversity in diet, resistance to diseases, pests, natural disasters and seasonal availability of foodstuffs". The most important staple foods (**kakana dina** or real foods) were taro (**Colocasia**

esculentia - dalo in Fijian - and yams (*Dioscorea alata*).¹³ Breadfruit (*Artocarpus altilis*) and the Tahitian chestnut (*Inocarpus fagifer*) were important seasonal staples. Finfish and shellfish provided animal protein both in the coastal regions and in the interior. Taro leaf and hibiscus spinach (*Hibiscus manihot*) were the important green vegetables. A number of varieties of banana and some citrus fruits were indigenous. Sugar cane and varieties of nuts provided snack and energy foods. The coconut palm (*Cocos nucifera*), described by Thaman "as the tree of life of Pacific islanders", was of

....critical dietary importance in coastal areas as well as grown to a lesser extent and 'imported' from the coast or urban markets to interior villages...Food was typically cooked once a day in the early evening where earth ovens were used, but sometimes twice a day where boiling was the main source of cooking. Root crops cooked the evening before were eaten throughout the following day along with foraged food. Children, as well as being given food, foraged for themselves (Rp78).

The main meal consisted of a staple food such as yams, eaten with flavouring foods, *i coi*. *I coi* consisted of fish, green leaves and coconut cream in coastal areas, while in the interior edible insects, lizards, birds and rats were eaten as well (Kleinschmidt, 1878; Parkinson, 1991a). It is this part of the diet that pregnant and breastfeeding women were least likely to have in sufficient quantity.

5.3.2. Food balance

At its best this diet is a nutritious one (Thaman, 1991). However, the balance is delicate, and the existence of foods even in the immediate environment does not guarantee their balanced presence each day or their proportionate distribution amongst individuals. Staple foods need long cooking, requiring substantial supplies of firewood and limiting the number of food preparation times. There were no ready sources of animal protein, other than fish, to provide easy supplementation of the staple diet, especially important for children. No milk producing animals were kept in Fijian villages. Eggs were not eaten. Pork was generally only eaten on festive occasions. Pulses and grains were not part of the Fijian diet. For young children and pregnant and lactating mothers, the diet is potentially low in protein, calcium and fat unless special attention is given to the fish, green leaf vegetable and coconut components of each individual's meal.

The WHO-recommended daily requirements of essential foods are shown in Tables I-1 and I-2, along with the composition of important Fijian foods.¹⁴ If the protein requirement is to be met, sources other than the staple foods are needed, especially for children and pregnant or lactating women. A woman eating primarily staples would need to eat over two kilos of dalo or yam a day to meet her requirements. Fish - the main source of protein - was unlikely to be eaten every day, and its

distribution among family members depended on the composition and size of the group eating together. Women received their food last (Ravuvu, 1983).

5.3.3. Food scarcity

Even in this relatively abundant setting food scarcities existed. These were the result of natural causes, communal obligations, and the differential availability of food stuffs in different parts of Fiji, in part as a result of limited arable land especially on some of the small islands. Hurricanes, floods and drought put severe but temporary strains on the food system. Food scarcities existed in areas either with limited reserves or where food resources were scarce in normal circumstances, as on the less fertile islands (Thompson, 1940a; Aalbersberg, 1991b).

5.3.4. Food tabus and restrictions

Apart from scarcity, the foods actually eaten were limited by tabus and restrictions, and by status within the household. Food tabus are common in Pacific island cultures for pregnant and breastfeeding women and for infants while weaning (Marshall, 1985).

Table I-2
Dietary Reference Values for Pregnant and Lactating Women and
Children, and Common Fiji Food Sources.

PROTEIN

Daily Requirements (grams)

	Women		Children			
	EAR*	RNI*			EAR*	RNI*
Pregnant	42.0**	51.0**	4-6 mo.		10.6	12.7
Lactating	47.0**	56.0**	7-9 mo.		11.0	13.7
			10 mo.-3 yrs.		11.5	14.7

Food Sources (grams protein per 100 grams source food)

Taro (Dalo: Colocasia esculenta)	2
Yam (Uvi: Dioscorea alata)	2
Tahitian chestnut (Ivi: Inocarpus edulis)	4
Coconut (mature meat)	4
Fish (steamed)	21.4

CALCIUM

Daily Requirements (milligrams)

	Women		Children			
	EAR*	RNI*			EAR*	RNI*
Pregnant	525	700	0-12 mo.		400	525
Lactating	1075	1250	1-3 yrs.		275	350

Food Sources (milligrams calcium per 100 grams source food)

Taro (Dalo: Colocasia esculenta)	13-32
Taro leaves	182
Yam (Uvi: Dioscorea alata)	10
Coconut (mature meat)	10-25
Fish (steamed)	22

*Estimated Average Requirement; Reference Nutrient Intake.

The RNI is the amount "that is enough for almost every individual, even someone who has high needs." (Salmon, 1991)

** Based on values for women 15-49 with additional 6g. for pregnant and 11g. for lactating women.

Sources: Aalbersberg (1991a); Holland (1992); Salmon(1991).

Table I-3
Nutrients furnished by immature coconuts (liquid and soft meat)
compared with human and cows' milk.

Nutrients	Two coconuts	Human milk/ 100 ml.	Cows' milk/ 100ml.
Protein	4.5 g.	1.2 g.	3.3 g.
Fat	23.9 g.	3.8 g.	3.7 g.
Calcium	74 mg.	34 mg.	126 mg.
Iron	2.6 mg.	1.4 mg.	0.9 mg.

Source: Murai et al. (1958) from Aalbersberg (1991a)

In Fiji these food tabus included fish in the infant diet, and, in the adult diet, **ka damu** (i.e. red things, including shellfish, some finfish and pork), foods cooked in salt (sea) water for women immediately after giving birth (Rp43), and totem foods (Parkinson, 1991b).⁹ As there are other food substitutes for adults, in most cases these tabus are unlikely to cause nutritional deficits. However, the **tabu** on feeding fish to infants, the origin and extent of which was unfortunately not analysed by the Commission, had more serious

consequences, as discussed below.

Probably the most serious non-customary restriction on food in late 19th century Fiji was that on the domestic use of coconuts -- a restriction which, where obeyed, would have especially affected pregnant and lactating women. The restriction on the use of coconuts was an early consequence of colonial policy through the system of native taxation. Although a monetary amount was settled on each province, the taxes were paid in cultivated products such as copra, sugar cane and tobacco, in order to keep the Fijians in the villages (Lal, 1992; Macnaught, 1982). Except in Lau, a tabu on the use of coconuts was in place for three and sometimes 6 months before the assessment dates.¹⁶ Although the ability of the Fijians to ignore "Native Regulations" is well documented, regulations related to taxation were administered at a local level by the **Bulis**, in whose interest it was to comply with these regulations.¹⁷ As such any breach of a **tabu** would be known, and the Report suggests that the tabu was largely honoured (Rp100).

5.3.5. Weaning diet

The weaning diet has been cited as a cause of infant morbidity and mortality for over a century (Report; Parkinson, 1991b, Robertson, 1991). However, the age at which the child was weaned, and its abruptness, will also have influenced the outcome for the child. The prematurely weaned infant was fed primarily on **ba** water, made from the boiled leaf stalks of **dalo**; if the infant survived, premasticated yams, **dalo** and fruits were added to the diet. An analysis of **ba** made in "native fashion" carried out for the Commissioners showed high quantities of glucose, moderate starch, some albumen but insufficient "proteids". The normally weaned child would have been introduced to these same foods premasticated or mashed, but would have had breast milk during the weaning process. Fish, the other most accessible form of protein, was apparently not considered a suitable infant food and surprisingly was not advocated by the colonial administrators to enrich the weaning diet.¹⁸ A more recent food analysis of the infant diet of the Amele in Papua New Guinea, who have a diet similar to that of Fijians, shows very low protein and calorie content in the supplementary foods (Jenkins et al., 1985). Mashed root and fruit broths contained less than 2.5% protein. Two 65 gram feeds per day would yield only 3.25 grams of protein and fewer than 200 calories. Most infants between 6 months and 1 year receiving only breastmilk and this supplementation lose weight relative to the Harvard standard. It is only when animal proteins such as fish are later added to the diet (typically by 16 months) along with food cooked in coconut milk that weight is maintained or gained relative to the standard. The portion size of starchy staple is only 58 grams by this age, so adequate nutrition depends on the appropriate additions of animal protein and

coconut to the diet. This analysis suggests the severe consequences for the abruptly weaned young infant in the absence of any animal protein in the diet, as was the case in Fiji. Additionally *lolo*, the coconut cream used in cooking throughout the South Pacific and an important food source, may not have been thought appropriate for infants (Jansen and Shrestha, 1991) and in some provinces may have been unavailable at times.

5.4. Diseases

5.4.1. The pathological environment

A number of sources offer evidence on the pathological environment in Fiji both prior to European contact and after. These include the earliest records of Europeans (e.g. see Manning, 1985); government records; the Decrease Report; and present day medical and epidemiological research on the geographic distribution of diseases -- especially those in isolated populations (e.g. Stannard, 1989, and Black, 1990). These latter sources are particularly important in helping to establish when diseases may have arrived in a population based on knowledge, for example, of the length of time a disease can persist in a small invading group like the crew of a ship. Equally, contemporary epidemiological research can suggest conditions in relation both to the geography of an area and distribution of a population which are typically necessary for an epidemic to occur. Thus, for example, Manning's suggestion that the first major epidemic in Fiji, the *Lila*, was caused by cholera is probably wrong both because cholera epidemics occur where the disease can be spread by communally used and relatively large sources of fresh water and because the then existing strains did not "easily travel" over long distances (Black, 1990). The best single source of evidence on the presence of both endemic and epidemic diseases in 19th century Fiji is the Report, although the Commission was not particularly concerned with dating the arrival of diseases, a more modern pre-occupation. The diseases noted in the Report are those thought to contribute to the decrease in the population as causes either of death or of infertility. Less serious diseases and conditions are probably underreported and some poorly understood diseases, such as acute respiratory diseases, receive little attention.

The mass diseases which had probably arrived over the previous century include measles, whooping cough, influenza, dengue fever, enteric fever and dysentery. Serious diseases which pre-dated the arrival of Europeans were yaws -- *framboesia*, *coko* (thought by the colonial administration to be "universal"), tuberculosis (thought to be widely prevalent), and leprosy (not apparently widely prevalent). Intestinal helminths included roundworm (*ascariases*) and *filariasis*; but hookworm (*ankylostomiasis*), which was to be a significant contributor to infant and child mortality in the early decades of the

next century, was probably not yet present in Fiji.³⁹ Although skin diseases were reported to be widely prevalent, especially among children (recorded often as "scrofula") they were not individually identified. Scabies and ringworm (*tinea imbricata*) may have been present before European contact and would have played an important role in the spread of yaws.

Tetanus probably arrived with the Indian immigrants, when it, including neonatal tetanus, was identified (see early Fiji Government Indian Immigration Reports). Smallpox was discovered amongst the early Indian indentured workers, initiating an impressive colony-wide campaign of immunization in 1879 (Guthrie, 1979). It is unclear why louse-borne typhus was not a cause of epidemics, at least after European contact. The presence of the human body louse is documented. However, in some parts of the colony, hair was treated for lice and there may have been other environmental factors which affected transmission to humans, if typhus was present (Kleinschmidt, 1878).

Fiji's relatively healthy pre-contact environment was due to both its distance and isolation from disease sources and the fact that there were few animal reservoirs. There are, for example, no indigenous mammals other than bats.⁴⁰ The Polynesian rat (*ratus exulans*) and pigs (*sus scrofa*) pre-dated Europeans. The Polynesian rat does not typically invade dwellings but pigs roamed freely in villages. Both the common brown and black rat were accidental 19th century European introductions, would have been found in dwellings, and could have been disease reservoirs. Cattle were not kept by Fijian villagers.

5.4.2. Epidemics

As we have seen, the first Governor arrived in the wake of the 1874 measles epidemic. There were no other measles epidemics until 1903, but there were epidemics of a number of other diseases between the time of cession and the formation of the Commission, all resulting in high levels of childhood and adult mortality. Epidemic diseases were seen by the Fijians as a primary cause of decrease in their numbers and these diseases were associated by many with the coming of the Europeans. The timing of these epidemics is no doubt approximate as they moved through the Colony at different rates.⁴¹ There is no definition in the report of what is considered an epidemic. Dysentery and influenza were considered endemic by 1892 (Rp18), although they were clearly also epidemic in the modern use of the term. (This is explored further in later chapters.) In 1884 the first whooping cough epidemic was recorded. In 1885-1886 epidemics of dengue, dysentery, and influenza were recorded. In 1890 and 1891 there were epidemics of whooping cough, influenza and dysentery. Dysentery and pneumonia often followed other epidemics.⁴²

Table I-4 shows the infant mortality rates (where available) for this period. These rates in the epidemic years are amongst the highest recorded. They correspond to Levels 2 and 3 of the Coale-Demeny life table system.

Table I-4
Annual Infant Mortality Rates: Fijians.
(1886-1901)

Year	Births	IMR	Year	Births	IMR
1886	3975	446	1894	3912	302
1887	4425	337	1895	3644	381
1888	4453	337	1896	3531	312
1889	4035	393	1897	3451	298
1890	-	400	1898	3481	313
1891	-	580	1899	3395	275
1892	-	-	1900	3616	349
1893	4111	447	1901	3362	328

Sources: Decree Report (1896). Annual Reports on the Vital Statistics of the Native Population.

5.4.3. Causes of death from illness in early childhood

Although epidemic diseases played an important role in childhood mortality in this period, the Commission analysed four non-epidemic diseases or conditions as of particular importance: **Ramusu**; diarrhoeal diseases, tuberculosis and yaws.

Ramusu

A frequent entry in the Native Register was "**ramusu**" as a cause of death. **Ramusu** means "broken" or "broken in two" (Capell, 1984).

The natives explain that this is the name given to accidents occurring to the child, when, [for example] owing to the carelessness of the person in whose charge it has been left, it has crawled or fallen over the logs of wood that serve as doorsteps and has received internal injuries...While... a large majority of the ailments incidental to childhood are wrongly ascribed to **ramusu** by external injuries it seems highly probable that mothers take their children to the plantation because they fear to leave them at home exposed to the risk of accident (Rp135).

It is noteworthy that Mosley and Chen (1984) include injury as one of their four proximate determinants. **Ramusu**, however, probably also included deaths which could not clearly be allocated to some other category, such as congenital deformities or internal diseases.

Diarrhoea and dysentery

The Commissioners wrote

Of the gravity of bowel disease in Fijians, and more especially in Fijian children, there can be no doubt; and that they are responsible for a very considerable proportion of the total deaths of natives may be seen from an analysis of any provincial Death Register ... The principal bowel diseases which affect Fijians are diarrhoea and dysentery --

diarrhoea more especially in young children and infants, dysentery in both children and adults (Rp154).

The Death Registers for two "large" provinces for "four years taken at random" show that over 40% of deaths to children (of all ages) were attributed to bowel diseases (Rp156). These diseases were considered by the Commission and its medical informants to be largely preventable. In respect of "infantile diarrhoea" and dysentery the causes "can be summed up as exposure, dirt, carelessness, bad feeding, bad water, bad nursing, badly-situated and badly drained towns, badly-built and dirty houses."

While acute diarrhoea in infants was believed by Europeans to be a common consequence of exposure to the elements, chronic diarrhoea, often fatal, was seen as the consequence of early weaning and "improper feeding". As a result of weaning because the mother is ill or "worn out by overwork" or her breast milk has "ceased to flow", infants are fed "on starchy and other foods before the child's digestive apparatus is sufficiently developed for the work it is thus called upon to perform." These weanlings could, it was thought, be saved by the use of milk in the weaning diet.

The complex aetiology of diarrhoeal diseases, the contribution of the observed environmental factors, as well as the early introduction of indigestible starches, the absence of milk in the weaning diet and the negative consequences of abrupt weaning are now well documented in medical literature on 'weanling diarrhoea' (Jelliffe and Stanfield, 1978; Ortiz, 1978; Black 1984).

Native nurses observed that **infants** did not "suffer from true dysentery" but children and adults suffered from both endemic and epidemic dysentery, the latter sometimes coming as a consequence of hurricanes and food shortages.⁴¹ Diarrhoea as a result of other diseases including tuberculosis and yaws was recognized by both Fijian informants and the Commission.

Tuberculosis

Tuberculosis was believed by the colonial administration to be widespread amongst Fijians (Rp156 and 180). Several types were recognized including chronic and acute pulmonary tuberculosis, "general" (probably miliary) tuberculosis, and lupus vulgaris. Gastrointestinal tuberculosis (referred to as **tabes mesenterica**) was thought to be particularly common amongst children. The symptoms of the latter were noted as "wasting and marasmus with enlargement of the abdomen, and perceptible enlargement of the glands at the back of the abdomen. With this there may be diarrhoea of the most obstinate kind (Rp180)." No attempts were made to establish the prevalence of tuberculosis and no clinical tests are reported. Thus diagnosis depended only on presentation of symptoms which in many cases would mimic other diseases. In particular the "strumous ulcerations" which

were "the commonest diseases met with in Fijians (Rp180)" would have required differential diagnosis in relation to yaws. Yaws was believed to be more severe in the children of tubercular parents. And children "weakened by a prolonged attack" of yaws were believed "more prone to die of some form of tuberculosis". These interrelationships of diseases were noted as "a prolific field for scientific investigations...too purely pathological and in the present state of knowledge too speculative... to claim more than a passing allusion in this Report."

Yaws

The Colonial Medical Officers, and through them the Commission, had a clear understanding of the clinical features and methods of transmission of yaws." However, Fijian beliefs were quite different from those of Europeans and were to be resistant to change. From the Fijian perspective it was essential to expose children to yaws, ideally between ages 2 and 6, in the hope that they would contract the disease in early childhood but not in infancy. If the child contracted and recovered from yaws it was believed it would grow up "plump and healthy." " There was particular fear of yaws in adulthood. It was said that "Nowadays there is scarcely an exception to the rule that every Fijian child contracts yaws." Chiefly children were not exposed and were not allowed to play with the children of commoners (Rp160). The fact that the disease progressed in stages, often with long latency periods, probably explained the fact that Fijians "do not recognize the connection between any of the sequelae of yaws and the original disease." This was the case even for particular named conditions now known to be a consequence of yaws, such as **kakaca** (skin that is cracked or split in many places) or **sucuve** (a sore under the foot) (Capell, 1984).

Apparently lacking an understanding of how yaws was communicated, no control of exposure was exercised by the Fijians. Thus, infants were exposed directly from other children, from dirty mats and from flies through open sores. Yaws in young infants was thought by Fijians and by medical professionals to be fatal, although yaws is not in itself fatal; it is fatal through intercurrent infections. The Commission minute on yaws associated its severity with children being "ill-nurtured", and argued that it brought on diarrhoea, dysentery and marasmus. It was noted that "they are strongly opposed to any medical treatment directed toward the cure of **coko**, except when the eruption recedes... too quickly (Rp162)." In this case native medicines were used to bring the eruption to the surface again. (Yaws is discussed further in Chapters III and V.)

5.4.4. Summary

While Fijians did not share European knowledge and beliefs about the causes or importance of some endemic diseases, such as yaws, they clearly recognized that the presence of new epidemic diseases had reduced their numbers. In the face of the enormity of these losses they expressed considerable passivity in addressing, as the Government hoped they would do, many of the problems which Europeans recognized as predisposing causes, e.g. infant diet and sanitation. As the next chapter shows, where the medical community could show empirically and reasonably quickly that treatment worked, as in the case of yaws, the Fijians were won over. But many appear to have remained unconvinced for several decades of the social and public health determinants of illness. For their part the Commission had recognised some of the important childhood diseases in Fiji but appeared not to have recognised the seriousness of others, such as whooping cough, nor the relative importance of diarrhoeal and respiratory infections in maintaining the high rates of childhood mortality.

5.5 Systems of Exchange

Traditional Fijian culture was characterised by a fragile but workable system of exchange. At its best it provided security for individuals and stability for the society as whole. Traditional exchange worked through **lala**, which defined the roles and obligations of chiefs and commoners and **kerekere**, part of the system of exchange amongst commoners. Both of these were subjected to the critical review of the Commission.

The chiefs in the years after cession will have feared that their authority would be undermined, perhaps especially in relation to **lala**, the rights of the chief to food, materials and work from his people for which the people received the care of the chief. But in fact the rights of **lala** were codified into law by the colonial administration and extended to the provision of services for the Government and at times, through the chiefs, to the churches. The Commission concluded in their review of the practice that it had no bearing on the decrease of the population as long as it was the "proper exercise of the chief's authority". Thus avoiding the inherent potential for abuse, the Government cemented its ties with the powerful chiefs. Over time, added to the burden of **lala**, the burdens of taxation and communal work created some dissent (see Lal, 1992). In 1905 the practice was officially abolished but continued in some areas.

In contrast to the custom of **lala**, the Commission recommended that the more important form of exchange amongst commoners **kerekere** "should be discouraged in every way." In providing a safety net for families and individuals **kerekere** will have ensured that even the most disadvantaged families and their children will have had at least the minimum of food and shelter. **Kerekere** is a primary form of

redistribution of goods and "use-rights" within a kindred group. **Kerekere**, derived from **kerea** (to ask for) could (and can today) be used to obtain food, goods, animals, money, transport, housing and land use. Kerekere is not always limited to close kin; however, as Sahlins as late as 1962 observed, "The significance of kinship for kerekere is that kin ethics, the obligation to give support, aid, and comfort dominate the transaction." In his analysis of kerekere, based in part on his years in Fiji, Geddes (1948) wrote, "The system was an insurance against misfortune, protecting the Fijian from the fears which haunt so many people in other societies." It also prevented the accumulation of wealth by any individual and supported ascribed rather than achieved status. Thus "social class" and caste important in analysing social change in most cultures is not easily captured here. However, as in any society, there was relative advantage for some individuals as a function of enterprise, ability, skill and luck. Successive colonial governments opposed, selectively, aspects of the communal system.

The opposition to **kerekere** was motivated by the realization that there was an inherent conflict between the values and practices of a capitalist economy -- supported by the accumulation of assets and investment by the individual -- and the communal system. (This is discussed further in Chapter V.) The practice of kerekere remained throughout the period of this investigation despite many resolutions against it and increasing criticisms of it from the chiefs themselves (see Ratu Penaia Ganilau's letter in Geddes, 1948).

6. Conclusion

The Report of the Commission is a remarkable document. Its sweeping scope and the modernity of some of its analyses are surprising. It included many pages of recommendations which would provide a blueprint for health policy over the next several decades (Lambert, 1941). Indeed, many were incorporated in the Native Regulations before the report was published in 1896. Recommendations were divided into the following categories: "Legislative" dealt **inter alia** with latrines, pig-keeping and yaws, use of tobacco by boys and girls and lactating women. These were incorporated in the Native Regulations, as we shall see in Chapter III. "Executive" included a school for native midwives, established in the next decade; and proposals for new house designs and pure drinking water, part of the programmes under Governor O'Brien described below. "Educational and Social" included "education in sanitary and social principles by books in the vernacular; issue of instructions in nursing, sick-diet." Recommendations thought best left "For discussion in the Native Councils" included "registration of rights to personal **lala**"; "attendance of children at school"; "relief of nursing-mothers from outdoor labour"; "supply of good food to mothers during the whole period of lactation".



As this brief review shows, the Fijians initially and passively resisted some of the proposed changes in customs (e.g. in relation to **kerekere**, age of marriage, the infant diet) -- in some cases undoubtedly at the price of higher childhood mortality rates. But many of the recommendations were the basis for government health initiatives and were over time accepted by the Fijians.

It was believed by the Commission that improved sanitation, water supplies and housing were areas that lay well within the control of government and could have immediate effects on mortality and population growth. The Commission concluded,

The science of sanitation is scarcely a century old. Less than two centuries ago the mortality in England, especially in the towns, was enormous... the subsequent rapid increase (in the population) dates from the time when the authorities woke to the necessity of meeting the attacks of disease by improved cleanliness and attention to sanitation. While the theory of germinal infection was still imperfectly understood, experience had shown that many lives could be saved by improved drainage, avoidance of damp, and attention to the sources of water supply (Rp84).

Public health initiatives formed the core of government health policy in the decade following the report, and these are described in Chapter III. These efforts have been perceived in at least one recent study as examples of deliberate and destructive colonial attempts to impose European lifestyles, in the interests of asserting central government authority (Thomas, 1990). The record, however, does not suggest this motive.

1. "Fijian" is used, as it is today, to describe the "indigenous" population, officially known as the "native" population until well into the twentieth century.

2. There is virtually no intermarriage between Fijian and Fiji-Indians.

3. Rates and probabilities are expressed x 1000 throughout.

4. For example, Mosley and Chen identify as proximate determinants: maternal factors, environmental contamination, nutrient deficiency, injury and personal illness control; Hilderbrand et al. infection, accidents and malnutrition. Basu elaborates the relationships still further, arguing that "not only do socio-economic and socio-cultural factors affect child mortality [through] the proximate determinants, the proximate determinant-child mortality relationship is also mediated [by these factors]".

6. Native Regulation 1 of 1891 required all Fijian children between the ages of 6 and 14 to attend school. According to the Education Commission which reported in 1909 this was not enforced, but nevertheless it had "little doubt that children are in regular attendance at schools in native towns and villages (CP30/10)". The schools were at that time almost entirely run by the Wesleyan and Catholic Missions.

7. Manning (1985) explores some of the issues covered in this dissertation over the same period. However, his work considers child and adult mortality of both Fijians and Fiji-Indians. He gives considerable space to the pre-cession period and to non-communicable diseases. The analysis of childhood mortality is limited.

8. Map 1 is from the Report on the Population of the Fiji Census, 1976. The dots on the map of the two main islands refer to urban areas. The dots on the outer islands are hospitals and dispensaries in the 1950s and have been added. This information is used in the analysis in Chapter V.

9. Rotuma, 240 miles to the north of Vanua Levu, was administered by the Fiji Government from 1881. The Rotumans are Polynesian with a distinct language. Rotumans made up a little over 2% of the combined Fijian/Rotuman population in the early decades of the colony, before substantial migration to other Fiji islands. From the 1936 census onwards Rotuma is treated as a separate province. It is not included in the analysis here, although in some cases, e.g. number of visits to provincial hospitals, numbers from Rotuma may be included without being identified in the original report as such. Rotumans are not included in counts of the "Fijian" population in censuses and government reports.

10. There are a number of histories which include this period. For different perspectives, see Derrick (1946); Legge (1958); France (1969); Macnaught (1982) and Heath (1974). Lal (1992) is the best most recent history of Fiji from cession to the present.

11. "European" then and now is a euphemism for "white" and included at this time Australians, New Zealanders, and Americans as well as Europeans. "Native" is a term used in reports

throughout the period under investigation here and is retained.

12. For different views on the extent to which this was truly "existing native organisation", or imposed by Gordon from a position of external authority, see France (1969) and Heath(1974).

13. The political management of the population decrease dogged Gordon throughout his tenure in Fiji. He complained shortly after his arrival that there was "universal suspicion on the part of the natives that the disease [measles] had been purposely introduced to destroy them (Gordon, 1912, Vol 1, 121)", and one of his last acts as Governor was to send an extremely long dispatch to the Secretary of State rebutting in great detail a letter in the Sydney Morning Herald from a leading missionary in Fiji asserting a continued decline and suggesting that the Government was covering it up (Gordon, 1912, Vol 4, 490-498).

14. These statistics are given in the Vital Statistics of the Native Population for the appropriate years. A "Resume" for the years up to 1887 was included in the "circular" inviting contributions to the inquiry into the decrease of the population: the circular is reproduced in the Report and is also found in CO83/55.

15. Basil Thomson's personal interest in the problem of assessing the causes of the decrease in the population may have been the motivating force behind the Government's extremely detailed investigation of the problem. He was an able analyst of statistical data and was one of the three named authors of the Decrease Report. The fact that his 1908 book, The Fijians, uses a substantial amount of the Commission's minuted material from the Report verbatim suggests that he may have written a great deal of it, although the medical sections are clearly written by Corney. His own submission to the Inquiry shows his early interest in and explanations of the problem of childhood mortality. After a full early career in the Colonial Service (including a period as Prime Minister to the King of Tonga) he returned to England, qualified as a barrister, served as Governor of three prisons and subsequently as Assistant Commissioner at Scotland Yard in charge of the C.I.D. He wrote a large number of books, including a series of detective stories.

16. This disparity should not suggest a bias on the part of the Commissioners. Where there was a question on which it was felt that only Fijians could inform the inquiry they sought information and it was typically presented in minute detail: see especially those sections on consanguinity and birth practices. However, the Commission appears to have consulted less on matters such as the effects of taxation and communal living on health, on which the Government already had strong views.

17. Few copies of the Report remain. One is in the National Archives of Fiji and two are in London, one in the British Library and one in the Institute for Commonwealth Studies, University of London.

18. Recent interest in the status of women in developing countries does not necessarily produce indicators which are appropriate for past times. Basu (1992), for example, grapples, not entirely satisfactorily as she admits, with some of the problems in defining women's status and opts in her own study in India for an operational definition based on exposure to and interaction with the world outside the household and autonomy within. The indicators include work outside the home, shopping, listening to the radio and decision making within the household. These indicators are inappropriate for 19th century Fiji. Caldwell (1986), discussed in Chapter V, offers others, such as women's ability to move about the country or own property. An analysis of these in relation to 19th century Fiji is outside the scope of this thesis.

19. This conclusion was largely wrong as Lau did show generally lower rates in non-epidemic years but the numbers of births and deaths are small and the series was a short one.

20. Where agricultural labour was provided by serfs or paid labourers, or in the colonies on large plantations, workers had little control over their working conditions, which in many cases were oppressive. Although this aspect of Fijian women's work is not documented, it is probable that these women had many more opportunities to control and negotiate their work load even if it was a heavy one. Other aspects of the lives of Eastern European women, such as pressures to limit breastfeeding and separations from young infants, are more relevant to the Fijian context.

21. Fiji's food production is not as seasonal as that of many cultures, although there are many seasonal foods. Early food production calendars can be seen in Williams (1858) and Seeman (1862). Although there was food storage in the ground and above, the food supplies, in particular fish and greens, needed to be regularly replenished. However, research on seasonal stress is relevant in showing what the effects of a heavy work burden might be.

22. See Williams (1858) on the violence of polygamous households. However, these informants may have been playing with Williams and other missionaries: "biting off" the nose of one wife by another may more likely be the result of yaws?

23. See Williams (1858) for drawings of dwellings and sleeping houses found in the traditional village.

24. It is, perhaps, ironic that Christianity was seen as freeing women from cultural restrictions. Clearly the rule of customary law was seen as more severe: "Formerly fear of violent punishment compelled (a girl's) obedience to her parents: now she disobeys them and fears violence no more. Then she knew that death might be the penalty for the loss of her virtue: now she knows that at the most she must plait a few mats or beat so many fathoms of masi, and be excommunicated if she happen to be a church member ... among primitive peoples the loss of the fear of immediate punishment for misdoing is followed by a weakening of the moral fibre (Rp125)."

25. Equally no shame was incurred when the "putative father" of a child was a man of high rank (Rp122).

26. However, Tongan mothers were traditionally reported to breastfeed immediately after birth (Rp144). And in some parts of the Solomon Islands breastfeeding begins within hours after birth and the infant receives "most" of the colostrum (Akin, 1985).

27. See also Parkinson (1991b) for other foods given in the first days after birth.

28. Various possible newborn foods are mentioned in the Report. It was concluded that the use of these, in most cases, led to the infant's death. Infant feeding strategies in some other Pacific Island cultures are briefly discussed.

29. Insufficiency of milk is not noted in other ethnographic sources used here. However, no other source gives any significant attention to breastfeeding practices.

30. The translations are from Capell (1984), who shows **lodo i susu** - "to be hungry for the breast" or "deficiency of breast milk (med.)", from **lado** "to suck strongly."

31. This section draws on the sources noted here, other early ethnographies and the Report itself, and benefits from the 1200 page compilation of papers in **"Food and Nutrition in Fiji"** (Jansen et al., 1991). This work latter is a valuable resource, although many of the papers are undigested summaries of historical and contemporary research and reports. There are notable exceptions, among them Thaman's authoritative paper on "The Evolution of the Fiji Food System". I have also drawn especially on Parkinson's papers and Aalbersberg's presentation of studies of food composition cited in the bibliography.

32. **Tabu** is a Fijian word with a complicated set of meanings (Capell, 1984). One of these is "forbidden, prohibited, implying religious sanction" but it is also used as a "legal prohibition such as 'no admission'", and is used to express superlatives e.g. very fine. **Tabus** can be imposed on oneself or by the community as, at some times, the **tabu** on eating coconuts which were needed for tax purposes.

33. Cassava or (**tavioka**) is a post-European introduction and is now the most commonly used staple root crop throughout Fiji.

34. These tables are drawn from several sources. The food component analyses come from several different studies which give very slightly different values and these have been averaged.

35. See Ravuvu (1991) for a useful discussion of a number of different food tabus.

36. The Report notes, "In Lau...the **tabu** does not apply to nuts used for food, but only to the sale of copra to Europeans before the assessment has been completed (Rp100)".

37. Tabus on coconuts were not only a result of colonial policy. Williams colourfully describes "nut tabus" as a part of the **lala**, work (and goods) required by the chiefs.

38. This **tabu** is poorly documented for Fiji. Parkinson (1991b) has described it based on personal communication with Fijian informants, and she and Dr. Savou, Director National Food and Nutrition Committee in Fiji, have elaborated on it in a personal communication to me. That it has long existed can be assumed from the lack of reference to fish in the infant and young child's diet. By the late 1930s it was recommended by some NMPs.

39. Laura Thompson (1940a) suggests that **Necator americanus** was endemic but this is not supported by earlier sources.

40. Paddy Ryan's **Fiji's Natural Heritage** (1988) is the source for this paragraph. The refusal of Fijians to keep cattle is well documented in government reports from cession until World War II.

41. The measles epidemic did not reach some of the Lau islands. The widely dispersed population meant that not all epidemics reached all areas. This probably also meant that immunity to diseases differed in different areas and may partly explain the sometimes wide fluctuations in provincial mortality rates.

42. See Thomson's report in CO83/55.

43. The young nursing infant would be less likely than other children to contract dysentery both by virtue of nursing and from the immune properties of breast milk (Mata and Urrutia, 1978).

44. Parts of this section of the Report read much like Bruce-Chwatt's (1978) paper on yaws in children in the tropics.

45. This practice was not only a Fijian one; see on Jamaica Hill (1953).

46. A prevalence study in one untreated community would suggest this estimate was too high. In a Jamaican community based on data from the 1930s, between 25-30% of children under 5 had acquired yaws, this percentage rising to between 50-60% for children 5-9 and 70-80% for children 10-14. However, differential immunities and the different distribution of disease in the two communities might affect the prevalence (Hill, 1953)

CHAPTER II

SOURCES OF DATA AND MEASURES OF CHILDHOOD MORTALITY

1. Introduction

This chapter describes the materials, the various sources of data and evidence used in this investigation, and the methods of estimating childhood mortality. The estimates of mortality trends, on which the analysis is based, depend on the vital registration system which was in place by the late 1870s, supplemented from the late 1930s by indirect estimates of childhood mortality based on census questions related to children ever born (CEB) and children surviving (CS). The vital registration system operated throughout the Colony, in contrast to some countries where registration was at its best in urban areas (see for example Diaz-Briquets, 1981, on Cuba; Bucht and El Badry, 1986, on Egypt). Its quality depended on the interest of the colonial administration in tracking population numbers and in implementing policies which would encourage an increase in the Fijian population. The system itself was carried out by the Fijian administration, the structure of which predated cession of the Colony to Britain.

Beginning with the 1946 and later censuses childhood mortality can be indirectly estimated. These estimates provide a long series of good quality, and are especially important after World War II when the completeness of vital registration declined.

2. Sources of Data on Infant and Child Mortality

The primary sources of data on childhood mortality, characteristics of the population and government health initiatives used in this analysis are the decennial censuses, the reports on vital statistics and the Medical Department Reports (MDRs).¹ The 1974 Fiji Fertility Survey (FFS) is an important source of data on individual level determinants of childhood mortality but is less extensively analysed here than are other sources; by 1974 the major decline in childhood mortality had already occurred. These sources are briefly described and evaluated in the following sections.

2.1. The censuses of the population

The 1881-1956 censuses are described in some detail by McArthur (1967) and this reference work is drawn on here, along with the original census reports after 1901. The early censuses

were largely carried out by the Fijian administration and were not usually under the administration of a professional Census Commissioner. They varied in the characteristics of the population which were assessed, and until 1946 the manner of reporting of individual characteristics, e.g. age, was the responsibility of the local official responsible for the census rather than the head of household or individual. Only the procedures as they apply to Fijians are described below; other component groups of the population were treated in different ways, especially in the early censuses.

A full evaluation of the quality of data in each census and its relationships with other censuses is outside the scope of this work. McArthur (1967) has evaluated some aspects of the early censuses and the later censuses have been evaluated by their principal analysts. An evaluation of age reporting in later censuses and of the reporting of CEB/CS is given in Section 4.2.1 below. A possible source of bias in assessing both total population numbers and provincial numbers, apart from simple underreporting, was likely to arise from the treatment of villagers who were away from their village temporarily for work, or women returning to parental homes for childbirth or children away at school. This topic is not analysed in detail in any of the census reports. The treatment of villagers living away from their villages differed from census to census and is noted in this analysis where there is information and it is relevant.

1881 Census

The 1881 census was the first formal census of the population of Fiji¹ and included all ethnic components. Bulis and their representatives were responsible for the Fijian village counts using notched sticks to denote age and sex. Age was recorded in broad groups: children (gone), youths (*cauravou*), adults (*uabula*) or aged (*qase*). Those not usually resident in villages were numbered with those who were. Males and females were enumerated by different people: males were enumerated by the buli or his representative, females by the "chief of the town" or his representative.

1891 Census

Bulis and their representatives were again responsible for the enumeration of the Fijian component of the population. Persons sleeping in the village on the night before the census were enumerated by name on a form allowing for 81 names, which in some cases limited the numbers included. There were fears among some Fijians that this census might be linked to an increase in tax assessment which may have increased pressures for underenumeration. However, on the basis of an analysis of the 1881 census, vital registration and ecclesiastical records, this was thought to be the most complete census to this date. Ages for Fijians (in categories as above) and sex were reported.

1901 Census

The enumeration of the Fijians was the responsibility of the Native Commissioner and took the same form as the 1891 census, including an instruction to enumerate numbers greater than 81 on a separate page. Again it was believed at the time that there was underreporting (McArthur, 1967).

1911 Census

A Census Commissioner was responsible for the census of all component parts of the population but again the Fijian village chief was responsible for enumerating his village. Age and sex were reported but marital status, which was asked of other groups, was not asked of Fijians or Rotumans.

1921 Census

The Fijian enumeration was again carried out by the village chief or his deputy; procedures differed for the different ethnic groups. Each individual was named and information was collected on age (chronological age for the first time), sex, marital status and birthplace as well as occupation, literacy and infirmities.

1936 Census

The Fijian census was similar to the 1921 census but information was transferred in Suva to cards, one for each person, which allowed more detailed analysis. More accurate specification of provincial boundaries was obtained than had existed in previous censuses, where magisterial district boundaries had been used (McArthur, 1967).

1946 Census

Procedures were the same for all components of the population and for the first time Fijian householders completed their own forms. There was some revision of provincial boundaries before the census, so provincial analyses are not strictly comparable with previous censuses. This was an ambitious census with 33 questions, including questions on infirmities and housing. The 1946 census was the first to include questions on children ever born and surviving (CEB/CS). These were included in all subsequent censuses.

1956, 1966, 1976, 1986 Censuses

The four most recent censuses have been carried out by demographers and employ contemporary demographic analyses. These censuses used the same form and procedures for all components of the population. Enumerators were trained and all households were separately visited.

The 1956 census was much simplified from the previous census. Data were gathered on fertility and child mortality, marital status, housing, type and place of work, but no question was asked on education or literacy. This census is extensively analysed in McArthur (1958).

The 1966, 1976 and 1986 censuses gathered basic demographic information as well as information on educational attainment and economic activity. Enumerators were trained and each household was visited. F.H.A.G. Zwart was responsible for the analyses of both the 1966 and 1976 censuses, and the latter analysis made full use of the then new indirect techniques for measurement of fertility and mortality (Zwart, 1968 and 1979). The 1986 census was rather more simply analysed by Gubhaju and his colleagues (Fiji Bureau of Statistics, 1989, and see Chandra and Bryant, 1990).

Changes in the definitions of enumeration areas, provincial and urban boundaries are documented in the reports of the last five censuses and are noted here where they are relevant to the analysis (see also Chandra, 1990).

Questions on CEB/CS differed in the five censuses and are described in Appendix A.

2.2. Registration of births and deaths

The registration of births and deaths was made a requirement by Native Regulation No. 13 of 1877, accompanied by a penalty of one shilling in the case of births and two in the case of deaths. Information on vital events was to be given to the **buli**, who every three months was to give a summary of these to the **Roko Tui**, who would forward them to the central Government (McArthur, 1967).³

This system depended not only on the interest of the Colonial administration in accurate knowledge of population trends but fundamentally on the **buli's** knowledge of and ability to record vital events. As the native district officer he had numerous administrative responsibilities but was responsible for relatively few people and villages. Macnaught (1982) has described the role of **buli** as somewhere between civil servant and "subsidized chief", at the apex of a "self-sufficient little world ... presiding over the eternal flow of goods and services." And yet he was

responsible for the implementation of all the orders of the Roko, the magistrates of the provincial council and the entire body of Native Regulations.

The 1891 Census provides some data on the average numbers of villages and people for which he would have been responsible (Table II-1). His effectiveness would depend on this number not becoming too large.

Table II-1

Average Number of Villages and Population per **buli** (1891 Census)

Population	105,800
Total number of villages	1,398
% Villages of <100	78%
Number of bulis	162
bulis /villages	8.6
bulis /population	653

Although the data on numbers of **bulis** are not found in other censuses, the number of villages declined somewhat between 1891 and 1911 as a result of, largely unsuccessful, attempts to amalgamate some of them. It is unlikely that the number of **bulis** would have declined, without record, as they have been described as the "linchpin" of the Fijian administration (Macnaught, 1982). In 1945 there were about 1800 villages and 185 **bulis**; however, by then the role was changing, reflecting the post-World War II reorganisation of the Fijian administration.

The above regulations, with minor changes, were in effect until 1948, when new regulations for Fijians were put into place. With the exception of Suva and surrounds, reporting of births, stillbirths, and deaths was still carried out through the **buli** but the length of time allowed in which births and deaths were to be registered was increased to two months. A significant change was in the fact that the designated **buli** was now either the **buli** of the Tikina, as before, or the nearest **buli** -- suggesting that there was no longer the personal relationship which had existed in the past between the **buli** and the population for which he was responsible, and the office had begun to approximate that of a Deputy Registrar-General.

The 1948 regulations involved changes which were likely to have increased the level of underregistration of vital events.⁴ Births, which previously were to have been reported within one week, were now to be reported within two months. Deaths which were to have been reported at once were now to be reported within two months. While there were new incentives to register births introduced in the intercensal period 1946-1956, as school attendance was made dependent on possession of a birth certificate, the 1956 census report estimates that between 10-15% of births were not reported. Where a child died shortly after birth it is probable that both births and deaths were seriously underregistered. The incompleteness of vital registration from the late 1940s is discussed below in Section 5.

The 1975 Births, Deaths and Marriages Registration Act created the current system of vital registration under the Registrar-General which is common to all ethnic groups. This depends on individuals coming forward to register vital events in the offices of the representatives of the Registrar-General. There is a small penalty for failure to register a birth within 12 months and no penalty for failure to register deaths (United

Nations Economic and Social Commission for Asia and the Pacific, 1987).

In the early 1970s a parallel system of reporting births and deaths was established through the Medical Department, which became the Ministry of Health in 1972. This has been the most complete system of reporting of births and deaths of children from that time. It is based on the "consolidated" monthly returns to the Ministry of Health from hospitals, nursing stations and district nurses. Information is provided by date of occurrence while that of the Registrar-General is by date of registration.

2.3. Reports of vital statistics

It is not clear from the early records who in government was responsible for compiling and reporting vital statistics. The 1877 regulation mentions the Registrar-General, but from about 1880 until 1915 Annual Reports on the "Vital Statistics of the Native Population" (VSNP) were submitted by the Native Commissioner to the Governor, and usually, though not apparently always, sent on to the Colonial Office in London. An average of the IMRs by province from 1881 to 1887 was reported in the circular of December 1891 inviting submissions for what was to become the Decrease Report, and this "resume" is used here for these years.

The original annual summaries of vital statistics relating to children for the years up to 1915 have been located for the years 1886, 1888-89, 1893-95, 1898, 1900-02, 1904, 1906-12 and 1914-15.⁵ These annual summaries are presented by province and include numbers of births, stillbirths, deaths under 1 month, over 1 month and under 1 year and over 1 year and under 5 years. From them stillbirth, neonatal, and infant mortality rates can be directly calculated and where there are 6 successive years of data (or where rates are imputed) child mortality rates can also be calculated. The reports of the VSNP for the years 1900, 1905 and 1914 give the IMRs from 1893 to 1914, and these reports were used for the IMRs for years in which no full summary could be located.

There was a hiatus in the reporting of Fijian vital statistics from 1916 to 1922.⁶ Reporting resumed with the Medical Department reports for 1923 and 1925-1938, which included numbers of births, infant deaths and child deaths (i.e. deaths aged 1 to 5 years grouped together). There was no report for

1924 or apparently for 1939, although later reports give rates for 1939. The MDRs report only infant mortality for the years 1940-1942. Thereafter numbers of child deaths (ages 1-5) are reported by age in years in the Medical Department and Ministry of Health, with the exception of the years 1976-1978.⁷ The annual "Blue Books" (summaries of government reports which were published for many British colonies) reported Fijian neonatal deaths for the years 1925-1938.

2.4. Evaluation of Data on Vital Events

The recording of vital events from the end of the last century until World War II was probably fairly complete. However, the tools to assess this are limited. Villages were and remained small; the great majority were under 100 population, and vital events of villagers would be known to the **Buli** or the village headman. A common system of Fijian administration existed throughout the Colony. As we have seen, in the early years the importance of accurate vital registration had been greatly stressed. The overall rates of childhood mortality were very high; at the end of the last century the levels of mortality were amongst the highest found in model life tables, suggesting that serious underreporting was unlikely and that the registration system was effective.

Nonetheless, the detail in recording age of death put a premium on identifying ages within categories of time which may not have had any cultural significance to parents, e.g. "under 1 month". There are a number of possible sources of misreporting which could affect the accuracy of the rates. Stillbirths may have included live births where death occurred shortly after birth. And if, as the Decrease Report and other reports suggest, mortality was particularly high in the second year of life, the inclusion of infants over 12 months in the category "under 1 year" would inflate the infant mortality rate. The upper boundary of 5 years may include children in their sixth year, although the recording categories specified that only children under 5 should be included. This is less serious than the possible inflation of the IMR as relatively few deaths are likely to occur between ages 5-6.

Both underreporting and misreporting are of particular importance in an analysis of rates in a given period. This analysis is concerned primarily with explaining trends in mortality. Absolute levels of mortality, at any point in time,

are somewhat less important, except where we are analysing periods of epidemics or the effects of specific programmes. In these period-specific analyses what is important is that there are no sharp disjunctions in the completeness of registration within a very short period. It is also important that the trends are not distorted by variations in completeness of registration over time. There is no evidence to suggest that there are these distortions until after World War II.

One possible means of assessing the quality of the vital registration is to compare the changes in population growth based on census reports with those from vital registration.⁸ The interpretation of this comparison, however, does depend on making some assessment of which source is likely to be more complete. If there is underenumeration in the early censuses (a possibility suggested in some of the reports), and if vital events are also underreported, there can be a spurious closeness. Censuses are often assumed to be more complete where there is deficient vital registration but where they are incomplete it is often at young ages.

Table II-2
Comparison of Census and Vital Registration Estimates of
Population Change (Fijians)

Year	Total Population	Rate of Change ¹	Average CBR ²	Average CDR ²	Rate of Change ³
1881	114,748				
1891	105,800	-8.1	37.7	41.4	-3.7
1901	94,393	-11.4	36.2	45.3	-9.1
1911	87,096	-8.0	38.0	46.5	-8.5
1921	84,475	-3.0	34.8	33.3	1.6
1936	97,651	9.5	34.2	23.0	11.2
1946	118,070	19.0	36.1 ⁴	19.5 ⁴	16.6
1956	148,134	22.7	36.4	13.2	23.2
1966	202,176	31.1	36.7	7.1	29.6

1. Rate of change per thousand between the previous and index census, exponential method described in Shryock et al. (1976).

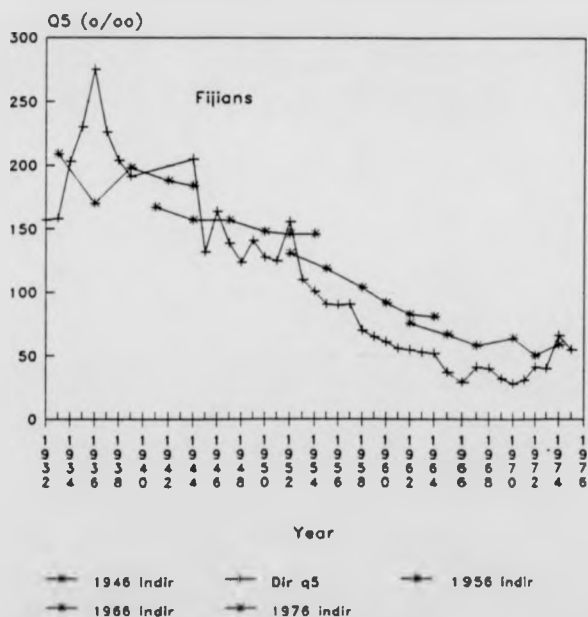
2. The 10-year average based on the rate for the year of the census and the nine years following, e.g. 1901-1911.

3. The difference between the average CBR and CDR.

4. Based on eight years; 1941 and 1942 were not reported.

In most of the early periods shown in Table II-2, the estimates of the change in the size of the population based on vital registration suggest a slightly larger population than the comparison of the two census estimates for the same period. This can occur when births are better registered than deaths and where there is underenumeration in the censuses. In this event the rate of change based on vital rates will be too high, and where censuses are underenumerated the rate may be too low (the exception would be if a previous census is better enumerated than a later one). Analyses of the completeness of vital registration in later periods (see Section 4.2.6) would suggest that births were better registered than deaths.

Figure II-1 Childhood Mortality 1932-1976
Direct and Indirect Estimates (CEB/CS),
1946,56,66,76 Censuses, Trussell, North



The differences in estimates are relatively small as a proportion of the population. The largest differences occur in the estimates for 1881-1891 and 1911-1921; it is likely that deaths were underregistered in the influenza pandemic of 1918. In the first

case the difference is 505; in the second 401. In both cases this is less than 0.5 percent of the population.⁹ The fact that the relationship between census-based estimates of rates of change and those based on vital registration is broadly maintained until after WWII might suggest that there are no substantial changes in the completeness of vital registration before and after WWII. However, from the 1940s onwards the completeness of registration can be assessed using indirect methods of mortality estimation. The closeness of the two estimates of rates of change in the intercensal periods 1946-56 and 1956-66 (Table II-2) occurs when we know that vital registration is less than complete, as shown by indirect estimates (Figure II-1).

Until the change in the system of registration of births and deaths which begins in the early 1970s, direct estimates give considerably lower estimates of q_5 than do indirect estimates. The most likely reason for this, and one which is analysed below, is that deaths are very greatly underregistered in relation to births. Where births are reasonably well registered but deaths are underregistered, the rates will be too low in relation to indirect estimates. Where both are underregistered, to roughly the same degree, the two types of estimates will be quite close. That is, the levels would coincide although births and deaths were approximately equally underregistered. This is likely to be atypical.

The magnitude and probable causes of the change in completeness of registration in the period after World War II are examined further in Section 5, after the discussion of the Brass method of indirect estimation of childhood mortality in the Fijian context in Section 4.2.

3. Other Sources of Data and Evidence

3.1. Medical Department reports

From 1909 detailed reports were issued from the Medical Department, after 1971 the Ministry of Health. These reports were extensively analysed for this work and provide much of the evidence on the timing and scope of health initiatives. Between 1910 and 1931 they include provincial reports. In many years they also include sub-reports on specific medical and epidemiological investigations and describe new programmes. As the NMPs and Medical Officers were responsible for the enforcement of the sanitary regulations, they also include reports on sanitation in the Fijian villages and public health initiatives. Reports also include sub-

sections on notifiable diseases, medical education, the work of the Colonial (later CWM) Hospital in Suva, and in later years other hospitals, and staffing. The diseases and conditions treated in the various hospitals are listed in some of the reports. Causes of death at the CWM Hospital, and later the other larger hospitals, are reported, but not by both age and ethnicity.

These are to a large extent progress reports, a summary of the year's work. The content varies to some extent from year to year and the style of the reports changes as they reflect the interests of the Chief Medical Officer and his staff. The reports often included appendices related to new health initiatives and occasionally reports on current research. The fact that many members of the medical establishment contributed to these reports helps give them their objectivity. They are not the observations and work of one man. However, in the early years remote areas were rarely visited. The European medical officers and the NMPs had many responsibilities and covered large geographic areas, so that even quite good descriptive reports of provincial sanitation, for example, may not apply equally to all localities. As in many of the other early government reports, there is clear evidence of ethnocentrism, especially in allocating responsibility for illnesses (e.g. tuberculosis is attributed to the "filthy" habit of spitting). But largely the Government in general, and the medical administration in particular, were greatly concerned with the welfare of the Fijians. Thus it was essential that the Department collaborate with and work in the interests of the Fijians, and this imperative emerges from its reports. Some of the work and the attitudes of key administrators were undoubtedly paternalistic. But the work of revisionist historians such as Thomas (1990) who suggests that the early health regulations "did little more than to bring Fijian practice into a degree of conformity with British values" or that "despite what has always been said about the preservation of the Fijian way of life, there was thus a good deal of cultural colonialism that attempted to transform what was simply different and unpalatable" is not borne out by the historical record.¹⁰ An example which is illustrative of medical practice and the attitude of the Medical Department at the beginning of this century is found in an article in the British Medical Journal of May 16, 1903, describing Corney's work in relation to midwifery amongst Fijians. He was well acquainted with Fijian childbirth practices as a result of his own work and the Decrease Report, and was a fluent Fijian

speaker. Following the Report and based on its findings two pamphlets were written in Fijian and widely distributed to encourage better management of childbirth, especially the treatment of the umbilical cord. Commenting on these pamphlets, the British Medical Journal noted in 1903,

Mindful that "a little knowledge is a dangerous thing" they [the authors] conclude ...by telling the native not to try and combine two things: to either follow strictly European methods, or to let them alone and stick to native custom.

There is, as yet, no public health history for Fiji. The analysis here depends to a considerable extent on the Medical Department reports. Perhaps the most notable problem in using these, or any other government reports, is that of assuming that because a treatment, a programme or an initiative is not described it did not exist. However, reading these reports together (and some, such as Gurd's in 1969, are particularly full and historical) and using other corroborating evidence, such as the NMPs Journal and textbooks of tropical medicine of the period, the analyst can assemble a reasonably full picture of medical practice.

3.2. The Fiji Fertility Survey (FFS)

The FFS, the first of the WFS surveys, was carried out in 1973 and 1974. The sample was a two-stage probability sample of non-institutional households. Only ever-married women were interviewed; 2045 Fijians between 15-49 were included in the final sample of individuals. The principal report (World Fertility Survey, 1976), including an evaluation of the survey, was written by John Cleland and is drawn on for this analysis. The FFS includes complete birth histories for each woman from which life-table ("survival") analyses of age patterns and individual determinants of childhood mortality can be calculated. A part of my own analysis of determinants of mortality is reported in this chapter and Chapter VI.

4. The Measurement of Childhood Mortality

The direct and indirect methods of estimating childhood mortality are described in this section. Section 4.1 describes the direct rates and probabilities. The Brass method of indirect estimation, used extensively in this analysis, is described in Section 4.2 in relation to the demographic context in Fiji.

4.1. Direct methods of estimating mortality

The various direct methods of estimating early age mortality are defined in Table II-3.

Table II-3

Definitions of Direct Methods of Estimating Mortality

CBR =	$\frac{\text{Births in year}}{\text{Population at mid-year}} \times 1,000$
CDR =	$\frac{\text{Deaths in year}}{\text{Population at mid-year}} \times 1,000$
IMR =	$\frac{\text{Deaths under age 1 in year}}{\text{Live births in year}} \times 1,000$
Late Neonatal MR =	$\frac{\text{Deaths 1-6 weeks}}{\text{Live births}} \times 1,000$
Post-Neonatal MR =	$\frac{\text{Deaths 4-52 weeks}}{\text{Live births}} \times 1,000$
Stillbirth Rate =	$\frac{\text{Late foetal deaths}}{\text{Late foetal deaths} + \text{Live births}} \times 1,000$
Perinatal MR =	$\frac{\text{Stillbirths} + \text{deaths under 1 week}}{\text{Still} + \text{Live births}} \times 1,000$
$M_x =$	$\frac{\text{Deaths during year of persons aged } x}{\text{Population aged } x \text{ at mid-year}}$
${}_4q_1 =$	$\frac{4 \times 4M_1}{1 + 4(1-4M_1) \times 4M_1}$ where $4M_1 = .4$
$q_5 =$	$q_1 + (1 - q_1) \times {}_4q_1$

The unadjusted infant mortality rate (IMR), as defined in Table II-3, is used throughout this analysis, both as a rate and to estimate q_0 , a probability.¹¹ Sometimes called the "conventional" IMR it is not a true rate nor a probability but a ratio.¹² Importantly, some of the deaths in a given year will have occurred to births in the previous year. Thus the number of births in the year is not the population at risk of the deaths in the numerator. A number of methods have been devised which make adjustments for this (Shryock et al., 1976). However, where births do not fluctuate greatly the conventional IMR is a reasonable measure of the probability of infants dying in the first year. Births do not fluctuate greatly in this series. One measure of this fluctuation is to calculate: (1) the absolute value of the difference between numbers of births between an index year and the previous year

(ABSV); (2) divide this ABSV by births in the index year, which gives the percentage of the difference in numbers of births in the two years to births in the index year; where numbers of births are the same this will be 0; 3) take the average of this percentage; and (4) compare the average to the percentage in each year. The average percentage over all the years where data are available is 4%. In four years the differences are large. These years are 1930 (12.8%); 1968 (17.0%) and 1969 (16.1%). Registration declined throughout the 1960s; 1929 and 1930 were epidemic years. These differences probably reflect delayed registration. The difference between births in 1944-1945 (11.8%) may have reflected a baby boom stemming from the return of men from military service.

Unlike the IMR the child mortality rate (CMR) is based on the mid-year population, in this case those ages 1-5. The rate is the deaths to those ages 1-5 in the index year e.g. 1969, divided by the mid-year population at these ages. The mid-year population can be calculated in a number of ways (Barclay, 1958). As calculated here, data on births and deaths for 6 consecutive years are needed which seriously limits the number of years for which the CMR, 4q1 or q5 can be calculated in the first two decades of this century.¹³ (The procedure is described in note 13).

Reporting of deaths until after World War II was only in grouped form between ages 1 and 5. Thus some estimation procedure is needed to estimate deaths in single years before then. The Coale-Demeny North model life table is used for this. The choice of model is described in Section 4.2.5.

Values of 4q1 and q5 are calculated as described in Table II-3. The IMR is used to estimate q1 in the calculation of q5.

No precise gestational age is given in the reports for what is considered a stillbirth. In the pre-WWII period designating a death a stillbirth would have been between the parents and the **buli**, in later periods between the medical staff and the parents.

In respect of the other rates in the table it should be noted again that the timing of deaths, outside of hospital, is likely to involve some misreporting. This will particularly affect the neonatal and stillbirth rates and is discussed further in later chapters.

The analyses which follow do not include separate mortality estimates by sex of child. The published vital registration data are variably complete as to sex, although the original records which have been found show that data were recorded by sex. The questions

on CEB/CS were reported by sex of child only after 1966.¹⁴

4.2. Indirect estimates of childhood mortality: an evaluation of the Brass method in the Fijian context.

Indirect methods of estimating infant and childhood mortality are used where registration of vital events is either incomplete, inaccurate or deficient in some other way. For this study, they are important because they provide estimates of childhood mortality from the late 1930s onwards, and as already noted, provide a means of assessing vital registration. The most widely used method is that developed by Brass (Brass, 1964; Brass et al., 1968). The method provides a relatively simple estimation procedure, deriving the probabilities of dying by an exact age from easily collected data from censuses or surveys. One of the strengths of the method lies in the fact that the $q(x)$ values are life table functions from which other functions can be derived when translated into an appropriate system of life tables.

Estimates of the probability of children dying between birth and exact age $q(x)$, where x varies from 1 - 20, are derived from data on children ever born (CEB) and children surviving (CS) by five-year age groups of women (denoted here by i , where i signifies age groups 15-19, 20-24... 45-49 and ranges from 1-7). The relationship between $D(i)$, a proportion based on the cumulated number of children surviving (or dead) and the number of children ever born to women in successive five-year age groups, and $q(x)$, the probability of dying before age x , was found by Brass to depend largely on the age pattern of fertility. The basic equation is

$$q(x) = k(i) D(i) \quad 2.1$$

where $k(i)$ is a multiplier based on the pattern of fertility and is dependent on the timing of the start of childbearing in a population. The Brass method and its variants have used model fertility schedules and observed schedules to inflate (or more rarely deflate) the proportion of children dead of those born to an age group of women in order to adjust (usually lengthen) the time for which children have been exposed to the risk of dying in the index population. This inflation is in line with the theoretical difference between the age distribution of children by age of mother in the index population and that of some standard; the level of inflation or deflation will be larger at the extremes of patterns of fertility. The adjustment of the proportions of children dead is related to the age pattern of fertility, that is the shape of the fertility distribution, not the level of fertility. The original

Brass method (1968) was based on a model fertility schedule and used relational model (logit) life tables derived from his General or African standards.

The Trussell variant of the Brass method (Trussell, 1975; Coale and Trussell, 1977; United Nations, 1983), using data classified by age of mother, is used in the analysis of trends and differentials in the following chapters. The Trussell multipliers, modified and extended for the U.N. Manual X, depend for their fertility location on the ratios of the average parities of women in the three youngest age groups, P_1/P_2 , and P_2/P_3 , where P is equal to the number of children ever born divided by the total number of women in the age group and 1,2,3 represent the age groups 15-19, 20-24 and 25-29.

The estimation equation takes the form

$$k(i) = a(i) + b(i) (P_1/P_2) + c(i) (P_2/P_3) \quad 2.2$$

where $a(i)$ and $b(i)$ and $c(i)$ are coefficients which vary by life table family but are the same within a family of life tables, e.g. the Coale-Demeny West family.

The original Brass method made a number of important limiting assumptions; two of these were constant levels of fertility and mortality. Additionally the accuracy of the estimates depends on a number of conditions such as an appropriate choice of mortality model and accurate reporting of age of women. These assumptions and conditions introduce varying levels of error into the estimates of $q(x)$. It is then important to see the basic equation as

$$q(x) = k(i) D(i) + e(i) \quad 2.3$$

where e is an error term which represents the errors and bias in the estimation of $q(x)$ which are the result of a number of factors which are specific to each estimate of $q(x)$ (see Arthur and Stoto, 1983). Other sources of potential bias in estimates of $q(x)$ have come to light more recently, as a result of the increasing availability of direct estimates of childhood mortality, especially from the World Fertility Surveys. For example, differentials in mortality by birth order of child have been shown to be important in some countries.

The major assumptions and conditions on which the method is based were largely outlined by Brass in the 1968 paper. Over time and in varying demographic contexts the relative importance of each has become apparent.

1. The method depends on data which are of reasonable quality and on an accurate assessment of the degree to which there are errors in reporting. Age reporting, the reporting of children ever born and surviving in total

and by sex must be of reasonably high quality and must be of particularly high quality when using methods based on two points in time e.g. estimation of intercensal mortality based on a hypothetical cohort (Zlotnik and Hill, 1981). A number of methods of evaluating data in these respects have evolved over time.¹⁵

2. It is assumed that the mortality experience of women alive at the time of the survey represents the mortality experience of those who have died. Both the selectivity of those women who die and the proportions will contribute to possible bias. These are unlikely to be serious sources of bias in the Fijian data. There is no anecdotal evidence that maternal mortality was high in the post-WWII period; reporting of maternal mortality did not start until 1967, and then not by ethnic group. The life expectancy of women was relatively high (Zwart, 1968 and 1979) throughout the post-WWII period. Although women who did die from pregnancy-related deaths are likely to have differed on important characteristics, e.g. number of pregnancies (Walsh et.al., 1990), their proportional contribution to the calculation of CEB/CS would have been small.

3. It is assumed that the risk of a child dying is a function of the age of the child -- that is its exposure to risk -- and not the age of the mother or factors related to the age of mother such as the birth order of the child.

4. While the original method assumed constant mortality, the effects of declining mortality have largely been addressed by methods locating the estimates backwards in time. These methods of time location depend on assumptions about the shape of the fertility distribution and come at the cost of assuming that the rate of decline in mortality is roughly linear. But, importantly, they make possible the description of trends in mortality.

5. The method also assumes constant fertility, although there are variants which address declining fertility. The sensitivity of the methods in estimating the age pattern of fertility is of particular importance when considering trends over a long period of time, as they should capture changes in fertility from one census or survey to another.

6. The method, to perform at its best, assumes that something is known about the age pattern of mortality in choosing an appropriate model of mortality.

In the following sections these assumptions and conditions are examined, with the exception of (2) above, which is not important in the Fijian context.

4.2.1. Age reporting and reporting of children ever born and dead

The accuracy of age reporting is an important indicator of the quality of the data used for the estimates. Age reporting in the four most recent censuses --1956, 1966, 1976, and 1986 -- for women between the ages of 15 and 49 is good and improves over the thirty year period. The percentage distributions of Fijian women by five year age groups and the age pyramids show no serious irregularities in any of the last four censuses. Age reporting in the 1946 census is poor.

The 1946 census shows considerable heaping on ages ending in 5 and 0. As an example, 1,618 Fijian women were reported as age 30, and only 286 as age 31; 1,162 were reported as age 40 and 538 and 272 at age 39 and 40, respectively. The Whipple Index measures the preference for ages ending in 0 and 5 on a scale from 100-500, with 100 indicating no preference, and is based on ages 23-62. Scores between 125-175 are considered as a "rough" estimate of reliability of age, scores over 175 "very rough". The Whipple Index for Fijian women from the 1946 Census was 158. The same index in 1956 measured 111, a change which was probably the result of better enumerator training (McArthur, 1958). For the four later censuses the Myers Index is a better measure as it measures heaping on all digits (not reported here) and gives an overall score indicating the level of misreporting.

Table II-4

The Minimum Percentage of Women Reporting an Inaccurate Terminal Digit in Age (Myers Index): 1956-1986 Censuses (Fijians).

1956	1966	1976	1986
4.0	3.3	2.0	1.2

The minimum numbers of women misreporting a final digit as measured by the index are reported in Table II-4. Age reporting in all of these censuses is considered good.

The questions on children ever born and dead/surviving differed in all five censuses, reflecting, in part, the development of demographic measurement in this period (see Appendix A.) The reporting and/or analysis of these data in the censuses between 1946-1976 do not conform to all of the requirements of the Brass method. For the Brass estimates all women in the relevant five-year age groups are included in the denominator or an adjustment is made for their exclusion (see

David et al., 1990); the numbers of women "not stated" for questions of parity and children dead should be included in the denominators of the calculations. Grouped data, e.g. data collected in the form of or coded as women with CEB 9+, present special problems as the contemporary analyst must estimate what the average number of the grouped data is, e.g. is the average 10, 11 or other for women recorded as CEB 9+. These problems are analysed in relation to the 1946-1976 censuses in Appendix B.

Tables II-5 and II-6 show the average number of children ever born (i.e. the average parities) and the proportions dead by five-year age groups of women as reported in the five censuses.

Table II-5
Average Number of Children Ever Born to Women in Age Groups 15-49
Fijians

Age Group	1946	1956	1966	1976	1986
15-19	.20	.09	.08	.08	.10
20-24	1.12	1.04	.99	.85	.82
25-29	2.34	2.50	2.54	2.10	1.95
30-34	3.53	3.72	3.87	3.32	3.02
35-39	4.48	4.64	4.91	4.38	3.81
40-44	4.70	5.34	5.44	5.07	4.36
45-49	--	5.81	5.46	5.59	4.66

Sources: Fiji Census Reports, 1946, 1956, 1966, 1976, 1986.

The average parities would be expected to increase with age of women and they do so in a reasonable way in the four most recent censuses, although the small differences between these for women 40-44 and 45-49 in the 1966 census suggest some underreporting of children or a decline in fertility amongst older age groups. The 1946 census shows some underreporting of children, assuming that fertility did not change between 1946-1956 and then change back again between 1956-1966. This underreporting is particularly serious in the reports for women 40-44.

The proportions of children dead should also increase with age of mother, from ages 20-24 onward. (Because of the small numbers of mothers and for other reasons (see below) the proportions dead of women 15-19 can be erratic and high.) This should reflect *inter alia* longer exposure to the risk of dying

of children of older women and higher levels of childhood mortality for older age cohorts of women. In the last four censuses these proportions increased, except for women 20-24 and 25-29 in 1976 and 1986 where the proportions are the same. This may be the result of a greater proportion of first births occurring to women between 20 and 24: if these births are subject to a higher rate of mortality the effect could be to equalize the proportions dead between the two younger age groups. (This is reviewed in Section 4.2.3) An alternative explanation may be the age pattern of mortality: deaths under 5 occur largely in the first three years of life amongst Fijians. Where deaths to children occur largely or almost exclusively to infants and very young children, the exposure to the risk of dying over time that would in other circumstances cause an increase in the proportions dead as age of mother increases will not do so. The 1946 dip in proportions dead for women 35-39 may be the result of age misreporting or underreporting of dead children.

Graphs of the estimates show that the series overlap reasonably well (See Figure II-1 and below Figure V-2). This is perhaps the best test of the quality of the reporting. Discrepancies between the 1946 and 1956 census estimates for similar time periods are discussed in Appendix B. Estimates based on the 1946 census are used here but the results must be interpreted with more caution.

4.2.2. Declining mortality

Table II-6

Proportions of Children Dead to Women in Five-year Age Groups
1946 to 1986 (Fijians)

Age Group	1946	1956	1966	1976	1986
15-19	.119	.092	.061	.050	.024
20-24	.144	.107	.061	.046	.031
25-29	.174	.131	.074	.046	.031
30-34	.201	.149	.092	.064	.035
35-39	.187	.173	.114	.063	.042
40-44	.249	.190	.142	.080	.052
45-49	----	.222	.173	.103	.064

Sources: Fiji Census Reports, 1946, 1956, 1966, 1976, 1986.

As Table II-6 shows, the proportions dead have declined over the period of the five censuses from proportions representing relatively high to those representing relatively low

mortality. The original Brass method assumed constant mortality in the years preceding the survey, although it was recognised that this was a restrictive assumption. As it became apparent that mortality was declining in most developing countries and in some very rapidly, attempts were made to relax this assumption with methods devised to "back date" the $q(x)$ values on the assumption that in a period of declining mortality there is a time at which the level of mortality implied by the estimate of $q(x)$ does apply. In the late 1970s Feeney (1976; 1980), Preston and Palloni (1977), and Coale and Trussell (1977) developed methods of establishing the time location of estimates of infant and childhood mortality. The method developed by Coale and Trussell is used here. It provides a method for estimating the time period to which mortality estimates apply with assumptions very similar to Feeney's, but not restricted to one mortality model and not derived from levels of infant mortality. This method, too, is based on the assumption that there is a time period prior to the survey or census to which the $q(x)$ values derived from an age group of women by the Brass method will apply. Assuming that changes in period mortality can be seen as movements through successive levels of a mortality schedule, this period can be specified. Cohort mortality "is derived by appropriately chaining together period levels" (Coale and Trussell, 1977). As with the multipliers used for the derivation of the qx values, those which establish the reference period for the estimates depend on adjusting for the pattern of fertility. The value $t(x)$, the number of years and months prior to the survey, is derived from the regression equation

$$t(x) = a(i) + b(i)(P(1)/P(2)) + c(i)(P(2)/P(3)) \quad 2.4$$

where x refers to the age specified by the qx value, i refers to the age group of women, and the coefficients are specific to the Coale-Demeny mortality models based on simulations. A particular estimate of $t(x)$, e.g. $t(3)$, indicates the period in years and months to which $q(3)$ applies. The choice of family of model life tables (MLT) used in deriving the qx values also determines the MLT table which applies $t(3)$ before the survey.

In the development of these methods of time location mortality is assumed to change linearly. This assumption, which probably rarely applies, does not apply for Fiji, particularly in the 1950s and 1960s when many public health programmes were initiated.

Given biases in data, the other assumptions of the Brass method, and the fact that mortality does not necessarily decline linearly, specifying the reference period to the month within a year is undoubtedly an over-specification. It is assumed in this analysis that the reference periods are approximate and are more accurate for estimates derived from later censuses.

4.2.3. Differential mortality by age of mother

The Brass method and its variants assume that the mortality of the child is dependent on its exposure to risk, i.e. the child's age, and not on the age of the mother or other factors correlated with age of the mother, such as differential mortality to first births. It was clear from Brass's earliest work on this method that this assumption would have to be relaxed, at least in respect of mortality to young mothers, which was known to bias estimates of q_1 based on women aged 15-19. Higher mortality to children born to women 15-19 is due, in part, to factors related directly to the maturational age of mother, such as immature physical development, which can manifest themselves in differential mortality particularly to first births; and, where early marriage is atypical, may be due to the low socioeconomic status of those who marry early. And early childhood mortality is particularly high to women who have a high concentration of births in a short period, which will occur when women have a very early start to childbearing and a fast pace of family building.

Bias in estimates of q_2 , estimates based on women 20-24, discussed in critiques of this Brass method (Preston, 1985; David et al, 1990; United Nations, 1990), is in part a function of the cumulation of deaths of children of teenage mothers where childbearing has an early start and to disproportionate deaths of first births amongst women aged 20-24, in later marrying societies. Birth concentration may also play a part.

What evidence is there of differential mortality by age of mother and birth order from data on Fiji? Survey data with which to investigate these effects within ethnic groups are limited and numbers are stretched, especially the number of deaths by age groups of mother. However, the FFS does offer some suggestive evidence, although the numbers of deaths are small. Looking first at the probability of dying in the first year of life for first births as compared to births 2-7, as measured by births in the 10 years prior to the survey, amongst Fijians there is somewhat higher mortality amongst first births ($q_1 = 46$) than births of

orders 2-7 ($q_1 = 38$). There is also higher mortality amongst very young women (q_1 for women ages 14-19 = 46) than among women ages 20-24 ($q_1 = 38$). The differences in both cases are small. Looking at estimates of q_1 by birth order and age of mother, q_1 based on first births to very young women is considerably higher than that for women 20-24, although there is no difference in q_1 between first and higher order births (i.e. 2-7) to women 20-24. The actual differences may be somewhat greater than reported here as these estimates are based only on married women. Age at marriage has remained remarkably constant over time for Fijian women, with a slight rise between 1976 and 1986. Fijian women who marry or have a child before age 18 or 19 may be socially disadvantaged and/or have conceived a child before marriage. Although conception and/or birth of a child outside of marriage does not carry with it any particularly strong moral or social sanctions amongst Fijians, it may mean that the prenatal care of the mother is deficient. It has been estimated that a fifth of Fijian children are conceived outside of marriage (see Pulea, 1986).

The proportions dead from the four censuses do not, in themselves, offer much evidence on the question of differential mortality by age of mother (Table II-6). The only year in which the proportions dead to very young mothers are higher than those to mothers 20-24 is 1976. This is not due to any difference in the proportions of women 15-19 having had at least one child, as might be expected. That is if there had been a sudden shift in patterns of fertility, women who had children at younger ages might be atypical of mothers generally. But for Fijians the numbers of women having children between the ages 15-19 are very small, thus these estimates will be subject to chance variation.

Although there is some evidence from the FFS, at least, that q_2 may be somewhat biased, the effects are not large. However looking back at Figure II-1 and ahead to Figure V-2 it is clear that the estimates based on women 20-24 are higher than would be expected. This is seen in the flatness of estimates based on the two youngest age groups or in some figures a higher estimate based on women 20-24 than that based on women 25-29 (see the estimate for 1974 in Figure V-2). (Estimates for women 15-19 are not shown in either of these graphs.)

4.2.4. Changing patterns of fertility

The Brass method assumes constant fertility and the method is, perhaps, at its weakest in accounting for fertility changes. The methods based on data collected at one point in time (i.e. the original Brass method and the Trussell variant) in many cases yield estimates based on data from older age groups of women which are too high. Although there is a variant of the method which attempts to take account of declining fertility when average parities are known at two points in time, it is relatively rarely used (United Nations, 1983). The current method of choice, in the absence of data on the ages of surviving children, is the method used to estimate intercensal mortality from a hypothetical intersurvey cohort (Zlotnik and Hill, 1981), which is used most commonly when mortality is also declining. This method, which has stringent data requirements, is not used here because of this. Its use would have been restricted to the last two censuses.

Declining fertility is the result of changes in a number of individual determinants, singly or in combination, such as rising age of marriage, fertility control in the early years of marriage and early stopping of childbearing. Changes in these determinants have differential effects on the fertility of women in different age groups. The effect on the multipliers which are used to calculate the probability of dying from the proportions dead is only through changes in the pattern of fertility, not its level; and only changes in the pattern of fertility to younger women, women 15-30, determine the size of the multipliers.

What evidence is there of changing levels and patterns of fertility amongst Fijians? The proportions marrying in younger age groups and the singulate mean age of marriage changed little for Fijians (Tables II-7A/B).

Table II-7

Age	1946	1956	1966	1976	1986
A. Percent of Fijian Women Never Married by Age					
15-19	85	88	90	86	90
20-24	32	40	42	42	49
B. Singulate Mean Age of Marriage: Fijian Women					
	22.1	22.3	22.4	22.1	23.4

Sources: Fiji Censuses, 1946, 1956, 1966, 1976, 1986.

However, the Fijian TFR declined significantly between 1966 and 1976 from 5.59 to 4.25 (Zwart, 1979) but not between 1976 and 1986 (Fiji Bureau of Statistics, 1989). The decline in the Age-Specific Fertility Rates (ASFR) was greatest in older age groups.¹⁶ This change in fertility from the mid-1960s to 1970s probably reflects the family planning campaigns of the middle 1960s onward, but the momentum was not maintained in the next decade (see Roizen et al., 1992).

The multipliers for adjusting for the effects of fertility, however, vary little in this period of fertility decline. The multipliers for all five censuses cover only a small part of the theoretically possible range of multipliers. Thus, it takes a very substantial difference in the pattern of fertility to have an effect on the multipliers. Brass has argued from the earliest essay (Brass, 1968) that the multipliers are relatively insensitive "to the detailed shape of the fertility function [as] suggested by the small range of correction factors even with quite different values of P_1/P_2 ". However, the problem remains that the same or similar parity ratios are possible under a number of different and changing patterns of fertility.

Two types of effects of declining fertility on the estimates of childhood mortality need to be distinguished: 1) The degree to which the multipliers based on the fertility patterns of younger age groups adequately define the pattern of fertility in older age groups when looking at the estimates from one survey or census; 2) The degree to which the multipliers are sensitive to changes in fertility using different surveys and censuses to establish mortality trends over a long period of time. In the case of Fiji, declining fertility in the recent past means that estimates of mortality based on, for example, the 1976 census are probably somewhat too high in older age groups, but this is may be confounded with under-reporting of deaths to older woman. Additionally the multipliers are not fully sensitive to the changes in the age pattern of fertility over the last three censuses. However, given the modest decline in fertility amongst Fijians these effects probably do not significantly bias the results.

4.2.5. Choice of mortality model

The Brass estimates themselves are not reliable indicators of the age pattern of mortality but depend, in their application, on the appropriate choice of model life table family (MLTF). The

choice is important as making the wrong one can give a distorted picture of the underlying relationship between infant and child mortality and will affect the appropriateness of other derived life table values for the population at hand.¹⁷ This choice depends on some knowledge of the age pattern of mortality in the first 5 years of life, a simple measure of which is the percent of deaths under 5 which occur between ages 1 and 5 ("% deaths 1-5").

Treating the model life tables as what has been called "the mortality experience of a cohort" (Shryock et al., 1976), the probabilities of dying (i.e. the q values) multiplied by 1000 give an estimate of the numbers of deaths between exact ages. Thus the numbers of deaths between ages 1-5 of those between 0 and 5 can be derived from each life table; the proportions give a simple measure of the age pattern. Table II-8 shows this age pattern of childhood mortality for the four Coale-Demeny MLTFs. The percentage of deaths between 1 and 5 differ for different MLTFs at the same levels of mortality and decrease as the level of mortality decreases, except where mortality rates are unusually high (low levels in the Coale-Demeny system).

Table II-8

Percentage of those dying under 5 who die between 1 and 5, under assumptions of Coale-Demeny Model Life Tables, and q_1 (0/00) at each level (Combined Sexes)

Level	North (q_1)	South (q_1)	East (q_1)	West (q_1)
3	38.0 (289)	43.5 (277)	23.7 (395)	30.4 (329)
9	40.8 (170)	42.7 (181)	26.9 (237)	33.0 (193)
12	40.5 (127)	39.8 (148)	26.3 (179)	33.0 (144)
14	39.3 (104)	37.0 (128)	25.2 (145)	31.6 (115)
16	37.4 (82)	33.6 (109)	23.7 (114)	29.7 (90)
18	35.1 (63)	28.8 (92)	21.3 (85)	27.1 (67)
20	32.3 (45)	23.4 (72)	16.9 (59)	22.0 (46)
24	14.4 (14)	11.8 (34)	8.1 (16)	10.4 (11)

For any one year, or short periods, the task of matching an observed proportion to a model life table is straightforward, although the match is by no means always exact.¹⁸ The more difficult problem is to choose a MLTF which best represents a long time period, as is necessary here. Failing that, the choice

of MLTF could vary from one short time period to the next. However, changing back and forth between MLTFs suggests that there is no underlying social or biological/pathological context which these models are meant to represent. This is an unsatisfying option for an analysis which is highly contextually grounded; although over a long period of time where there is evidence of a change in the age pattern of mortality, e.g. as a result of immunisation programmes, the MLTF would change. In some countries as mortality declines to relatively low levels child mortality will have declined faster than infant mortality. Thus the life tables for earlier and later periods will differ in mortality pattern as well as level (see Rutstein, 1983).

The next step is to analyse the "% deaths 1-5" for the population and establish the stability or otherwise of this proportion over time. Ideally this percentage should remain relatively stable over short time periods and decrease as the level of mortality decreases. Crises or epidemic mortality at frequent intervals can work against this stability.

As Table II-9 shows, the "% deaths 1-5" varies from a low of 28% in both 1923 and 1926 to a high of 53% in 1937 from the beginning of the century to the 1946 census, when the first indirect estimates of mortality can be calculated. Using a three year moving average reduces this difference to 31% in 1926 and 49% in 1936. Averaging the "% deaths 1-5" in Table II-9 for different substantively important time periods gives the following results: 1900-1915 =39%; 1925-1929 =33% (these data are not reported for the early 1920s); 1930-1938 =42%. Thus, the average is substantially higher in the 1930s than in the 1920s. The "% deaths 1-5" remains high even when childhood mortality begins its sharp decline in the 1950s and 1960s and does not reach relatively low levels until the late 1980s.

Table II-9
Infant Mortality Rate and Percentage of Deaths under 5 who
Died between 1 and 5 (1893-1915 and 1923-1986)

Year	IMR	% 1-5	Year	IMR	% 1-5	Year	IMR	% 1-5
1893	447	29.9	1930	186	46.8	1960	32	42.5
1894	302	43.2	1931	113	40.2	1961	30	42.2
1895	381	42.7	1932	100	30.0	1962	37	34.5
1896	312		1933	98	34.4	1963	25	44.0
1897	298		1934	126	38.3	1964	28	45.0
1898	313	38.0	1935	126	43.7	1965	19	39.3
1899	274		1936	140	49.6	1966	16	38.5
1900	349	35.5	1937	96	53.0	1967	22	47.1
1901	328	34.7	1938	107	46.5	1968	21	48.5
1902	245	40.5	1939	107		1969	22	37.3
1903	506		1940	70	47.4	1970	18	43.1
1904	306	42.7	1941	80		1971	22	40.6
1905	256		1942	84		1972	37*	38.0
1906	273	30.5	1943	91	42.1	1973	34*	23.9
1907	278	37.8	1944	119	43.4	1974	38*	41.2
1908	252	35.2	1945	68	46.0	1975	32*	36.4
1909	234	41.6	1946	80	47.9	1976	35*	
1910	270	43.2	1947	75	44.1	1977	30*	
1911	257	44.4	1948	60	46.4	1978	24*	
1912	198	38.2	1949	70	49.2	1979	27*	29.2
1913	211		1950	60	48.1	1980	31*	28.2
1914	210	41.1	1951	68	47.3	1981	27*	28.5
1915	184	39.0	1952	79	49.2	1982	25*	28.9
1923	168	28.0	1953	60	42.0	1983	23*	24.3
1924			1954	50	43.8	1984	22*	36.1
1925	173	34.4	1955	73	27.4	1985	16*	32.3
1926	155	28.0	1956	48	35.4	1986	19*	30.8
1927	158	32.0	1957	42	47.3	* Ministry of Health Notification System See page 61.		
1928	146	35.7	1958	38	41.9			
1929	167	36.4	1959	38	38.6			

Thus the "% deaths 1-5" is not stable over time and does not decrease even when mortality reaches the moderate levels of the late 1960s. Although none of the Coale-Demeny models provide a good match of the Fijian age pattern, the North model most closely approximates it in that the proportion of deaths to children 1-5

stays high even at relatively low levels of mortality. And on substantive grounds the North model is probably the best single choice as it is often used where breastfeeding is the common practice, and where weaning typically occurs after 12 months -- circumstances in which childhood mortality is high relative to infant mortality (United Nations, 1983). These are both practices which occurred throughout the period analysed here. As late as 1974 the FFS shows that the median duration of breastfeeding was between 10-11 months for women in rural areas (World Fertility Survey, 1976).

The North model is used throughout this analysis.¹⁹ Trends are established by translating the q_x value based on the age groups of women in each census to a common value, e.g. q_5 , based on the MLTFs chosen, in this case the North and West families. Using q_5 as a common index reduces the risk involved in the wrong choice of model as the models differ less at q_5 than q_1 at any given mortality level.²⁰ However, factors which bias an estimate of q_x , in particular q_1 and q_2 , will thus bias values derived from it. For this reason values based on q_1 are not used in the calculation of trends, and as the graphic representations of the trends show, values based on q_2 produce corresponding q_x values which are out of line in some cases.

In the next section Brass type estimates are used to evaluate the completeness of registration in the last three intercensal periods.

4.2.6. Completeness of registration 1956-1986

Using child survivorship data based on the method described above, Brass (1979) reported a method of evaluating the completeness of birth and death registration for ages under 10 years. Data from the 1966 Fiji census and from vital registration were used to illustrate the method. The method has the advantage over some others of giving separate estimates for the quality of reporting of births and deaths. The average parities of women in five year age groups, the proportions dead within these age groups and some standard or model by which patterns of fertility are accounted for, give L_x values from which the numbers of births for single year age cohorts can be estimated within the intercensal period. The L_x values are used to reverse survive the numbers alive at the census giving a number of expected (E) births against which registered (R) births can be compared. The ratio of R/E (averaged for ages 2 years and older) can then be used to correct the registered births. The

Lx values applied to these corrected births give the number of expected deaths against which registered deaths can be compared.

Brass (1979) found that while 87% of Fijian births were registered, only 46% of deaths were registered in the period 1956-1966.²¹ Zwart (1979), apparently using the same standard, estimated that 87% of Fijian births and 48% of deaths were registered in the period 1966-1976. We shall look at possible reasons for this in Section 5.

For the analysis of the intercensal period 1976-1986, carried out here, the Lx values are derived from the qx values based on the 1986 census, using the Brass method (Trussell variant) described above. Registration data from the Ministry of Health are used. As Table II-10 shows, an estimated 99% of births are registered (averaging the three R/E values for births based on ages 2-5).²² Averaging the equivalent values for deaths suggests that 85% of deaths are registered. But the value '1.009' based on those age 3 is suspect. If there is underenumeration in the census, the R/E births can be too high. Errors in age reporting will lead to inaccuracies in both R/E births and deaths. And these are relatively small numbers so there is the possibility of chance variation. If the series could be extended to ages 5 and over it would give a longer series from which to estimate but Ministry of Health data do not extend beyond age 4-5. It would be reasonable to assume that between 75% and 85% of deaths are registered based on this analysis. It is clear that birth and especially death registration has improved since the 1976 census, based on Ministry of Health reporting.

Table II-10
Registered and Expected Births and Deaths: Fiji 1982-1986
Fijians

Age at census	Alive at census	Lx	Births expected	Registered births	R/E births
0	10384	.981	10581	10502	.993
1	9786	.970	10091	10385	1.029
2	9978	.968	10313	10264	.995
3	9878	.968	10209	10119	.991
4	9387	.955	9829	9708	.988

Table II-10 (continued)

Age at census	Corrected births	Estimated deaths	Registered deaths	R/E deaths
0	10593	197	139	.705
1	10475	316	195	.616
2	10353	336	263	.782
3	10207	331	334	1.009
4	9792	441	332	.753

4.2.7. Summary

The Brass method of estimating child survivorship has been shown to be remarkably robust, giving reasonable estimates where data are poor and the assumptions of the method are not fully met. By contrast with much data from developing countries, the Fiji data are good -- with the exception of the 1946 census.²³ As the analysis in the following chapters will show, the trends drawn from the various censuses line up well. There is some tendency to flatness in the estimates based on women in their 20s which may be the result of the elevated q2 or other assumptions not being fully met. The estimates of q5 are probably better than those of q1, but q1 is presented in some cases along with direct estimates of the IMR.

5. An Assessment of the Causes of Declining Vital Registration after World War II

The mortality estimates used here depend on vital registration before WWII and on vital registration and indirect estimates after WWII. Indirect estimates show that the quality of vital registration in the post-WWII period declined and declined significantly in the 1950s and 1960s. How does this affect confidence in vital registration (VR) prior to WWII and what are the possible causes of a decline in quality of registration after the War?

Table II-11 shows direct and indirect estimates and the proportional difference between them based on indirect estimates for a number of periods between 1935 and 1972. These estimates must be considered closely in order to build up a picture of the changing quality of VR. The 1930s saw a succession of epidemics and great volatility in mortality rates (this is discussed in Chapter IV). There are few data points from indirect estimates. The direct estimates shown in Table II-11 are an average of five

years because of the volatility in rates. Probably the best single indirect estimate is that for 1939 based on women 30-34, usually a reliable estimate. This underestimates q5 based on direct estimates by 14%. The indirect estimate is an average of the childhood mortality experience of women over the previous decade and a half. There may be some underreporting of deaths in this age group but these estimates do not suggest underregistration. World War II had a considerable impact on social life in Fiji, as we shall see in Chapter V; vital events were not reported for some years and government department reports were in many cases sketchy and in some cases unpublished. The comparison of direct and indirect estimates suggests 15% underregistration at a minimum, depending on which census estimate is used. The estimates for 1950-1952 illustrate one of the problems in comparing direct and indirect estimates, which is the choice of years. Exclusion of 1952, a year of unusually high childhood mortality, gives an estimate of underregistration similar to that in the mid-1940s; inclusion gives an estimate that suggests that registration is reasonably good. However, by 1955-1957 it is clear that Vital Registration had deteriorated sharply. What are the possible causes of this apparently rapid decline in VR?

Table II-11

Differences between direct and indirect estimates of childhood mortality: 1935-72

Years	Direct	Indirect	Indirect estimate Census year/ year of estimate	% Difference (based on indirect estimates)
1935-39	225	198	1946C/1939	-14
1945-47	145	170 184 157	1946C/1944 1956C/1944	15
1950-52	136	146	1956C/1952	7
1950-51	126			14
1955-57	90	132 146 119	1956C/1954 1966C/1955	32
1960-62	57	88 92 83	1966C/1960 1966C/1962	35
1965-67	35	74 81 67	1966C/1964 1976C/1965	53
1970-72	33	57 64 50	1976C/1970 1976C/1972	42

The pre-war system of vital registration depended on a close relationship between the **buli** and the villages and people

he was responsible for. The post-war period saw sweeping changes in the Fijian administration ("the government within a government (Lal, 1992)"). It was to be a modern administration. Fijian administrators, including **bulis**, were being drawn from those who had served in the war, thus introducing new criteria for appointment beyond traditional authority. The number of provinces was reduced, and larger "social and administrative units" were formed at the sub-provincial level by combining villages and districts (Sukuna, 1944). In his 1967 Report as Minister for Fijian Affairs and Local Government (CP33/67) Ratu (later Sir) Penaia Ganilau (later to be Governor-General and, later still, first President of the Republic of Fiji) gave a full historical account. Many posts were still filled by chiefs, but "they were [now] performing their tasks in their capacity as officials in a wider bureaucracy not as local chiefs". Commoners "with education and influence" were to be appointed, especially from the "numbers of disbanded [soldiers] of high calibre in search of civil employment". And they were moved around. "Service with the Fijian Administration became a career; [officials] were interchangeable between provinces irrespective of their own traditional affiliations."

Additionally, the primary concern of the Government was no longer maintaining the numbers of the Fijian population, although this remained a concern especially in relation to the Fiji-Indian population. Both the Colonial and the Fijian administrations were confronted with the problem of economic development in the Fijian community. The **Rokos** and **bulis** were under great pressure to take action on complex economic development problems. A 1948 Fijian administration circular instructs them that "the Fijian Affairs Board feels that it is of vital importance that **Roko Tui** and **buli** should give special attention to the existing economic conditions in their provinces and **tikina** (Scarr, 1982). These development problems were to prove to be quite intractable, and undoubtedly created a conflict between these and other administrative concerns. (This is discussed further in Chapter V.)

These changes in the Fijian administration coincided with changes in the procedures for registering births and deaths described above in Section 2.2.

Another more indirect indicator of administrative breakdown is the failure over time of provinces to pay their taxes. In 1962 the Governor, Sir Kenneth Maddocks, argued "during the last few

years there has been a most serious falling off in the payment of provincial rates -- so serious as to endanger the very existence of the Fijian Administration in its present form (CP33/67).² Reorganisation was again undertaken; by 1967 a new local government structure had been established, the **tikina** had disappeared as a level of government, and "the **buli**, most of them after very many years of loyal and faithful service, will have relinquished their posts, some of them for others in the new organisation (Ganilau, 1967)".

By 1946 nearly a quarter of Fijians were living away from their own villages, which also may have influenced the quality of VR. These factors, taken together, offer a compelling explanation of the change from a system of vital registration, at least as it affected children, which Norma McArthur describes as virtually complete at the turn of the century to a system which was slowly breaking down. However, even given the declining quality, as the analyses below will show, vital registration remained responsive to epidemics and health initiatives within relatively short periods of time.

6. Conclusion

Although there are deficiencies in the vital registration data on childhood mortality, this is a remarkably complete series. The fact that the CEB/CS questions have been asked in five censuses also enhances the analytic prospects, allowing both for estimation of levels of mortality as well as further evaluation of vital rates. The concern on the part of the Government with depopulation generally and childhood mortality specifically has left a relatively full documentary record which can be used to describe and evaluate health initiatives and technologies. Although there is some evidence of possible bias in the indirect estimates the coincidence of the series suggests that these are estimates of good quality. Using these estimates to evaluate direct estimates of mortality shows that births have been well recorded but there has been serious underregistration of deaths in the post-World War II period.

The balance of the evidence suggests that vital registration is quite good and can be relied upon to describe trends in the period before World War II. From the late 1930s onwards vital registration is supplemented by indirect estimates based on data from repeated censuses to measure levels and trends.

1. Decennial censuses were conducted between 1881 and 1921. The next census was conducted in 1936 with decennial censuses following that.

2. The first attempt to count the whole population of Fiji, undertaken in 1879, was described by McArthur (1967) as "primarily a count of Fijian heads ... better regarded as an informed estimate than as a census". It was acknowledged at the time to be incomplete. This and other precensal counts are described in detail by McArthur.

3. These positions in the Fijian administration are described in Chapter I.

4. The wording of the 1948 regulation is found in McArthur (1967) and see United Nations Economic and Social Commission for Asia and the Pacific (1987).

5. The annual and some quarterly reports of vital statistics can be found in the National Archives, Suva, Fiji, and in the Public Record Office, Kew. In neither place is the material fully indexed. The sometimes handwritten reports for the late 1800s are found bound into large volumes which contain, *inter alia*, reports, correspondence, receipts and notes. Thus the fact that certain years have not been located does not necessarily mean that the original records or government reports on vital statistics do not exist.

6. See, however, Figure III-4 for data on this period from Lambert, 1938.

The Registrar-General's Report (RGR) for 1915 reports on the vital events of "Europeans, Half-castes, Samoans, Chinese and free Indians only". The following year, however, it is reported that "In accordance with the recommendations of the Committee which reported on the workings of the Native Affairs Department in 1915, the registration of the births, deaths and marriages [of native Fijians] was on the 1st. of January, 1916, transferred to the Registrar-General's Department." Accordingly, the Registrar-General's Report for 1916 states that "statistics referring to natives are included in this report for the first time, but have not been incorporated with those referring to other races as the particulars given to this office in respect of native births, deaths and marriages are not given in the same detail as in the case of other races."

In fact, the figures reported in the RGR for 1916 show Fijian births, deaths and marriages and total population by province and sex: however, no ages of death are reported. The RGR for 1917 makes no reference to Fijians at all. No published RGRs have been located for the years 1918 to 1929. There is a report for 1930 and reports were published for 1935-1938 and then regularly from 1946 onward.

7. In this study "Ages 1-5" denotes those children between their first and fifth birthdays, "Ages 0-5" denotes those children between birth and their fifth birthday. Rates used here include only deaths which occur before the fifth birthday, i.e. under-five mortality, subject to the accuracy of age reporting.

8. With the exception of WWII, the Fijian population can be considered 'closed' until the 1970s.

9. This is calculated by taking the difference in the two estimates (for 1881-1891 this is 4.4/1000) and multiplying it by the estimated population at the start of the period.

10. The imperious style of Governor O'Brien, discussed in the next chapter, is an exception.

11. Two types of demographic notation are used here to express probabilities. Standard demographic notation is used : nx_x defines the probability of dying between exact ages "x" and "x+n". Thus $4q_1$ is the probability of dying between age one and exactly five (1+4) years; n is the number of years being considered x is the starting age.

Brass-type indirect methods often use a different notation where nq_0 is written as qn . This is used here as well. Thus q_5 is equivalent to $5q_0$.

12. A ratio is simply one number divided by another which shows the relative size of the two numbers. A rate is defined as the number of events which occur within a given time interval divided by the average population exposed to risk in the interval. A probability differs from a rate in that the denominator is the population at the beginning of the time interval.

13. The mid-year population ages 1-5 is calculated in the following way: define an age cohort as those born from mid-year to mid-year (as contrasted with births within a calendar year); for example, the mid-year cohort of those aged 4-5 in 1969 is one born in the second half of 1964 and the first half of 1965. This is estimated by averaging the births in 1964 and 1965. Deaths before reaching five years of age to this cohort are estimated for each year by taking half of the average of the deaths to those ages 0-1 in 1964-1965, those 1-2 in 1965-1966 ... those 4-5 1969. The mid-year cohort of those aged 3-4 in 1969 is based on the average of births in 1965-1966 with survivors in 1969 calculated as before and so on for the cohort aged 2-3 and 1-2. The four cohorts which make up the mid-year population 1-5 make up the denominator of the CMR, deaths in the index year (1969) to those ages 1-5 are the numerator.

The CMR is sometimes calculated from census data. The mid-year population ages 1-5 is the denominator and deaths based on vital registration are the numerator. This method is not used here.

Numbers of deaths 1-5 are imputed for 1899, 1905, 1913 and 1924. For 1899, 1905 and 1913, these are based on averages for surrounding years. The number of deaths in 1923 is used for 1924.

Bavadra et al. (1982) have estimated child mortality rates for 1925-1980. It is not clear what estimates of mid-year population were used but as a senior official of the Ministry of Health Dr. Bavadra would have had access to unpublished data. The Bavadra estimates have been used for the 1920s and 1930s for years which the method described above could not be used e.g. where there were not six consecutive years of data. They have been used in several other years where there is no published estimate or where there are not six consecutive years. Where the Bavadra estimates are used, this is noted.

14. The 1976 census report, Volume I, does not publish the original data on CEB/CS by sex, although there is some analysis in Zwart (1979).

15. Mortality estimates in this analysis are only given for both sexes combined, using model life tables for both sexes combined with a sex ratio of 1.07.

16. The ASFR for women 20-24 declined by 17% while that for women 35-39 declined by 31% and for women 40-44 by 37%.

17. This problem is well reviewed in United Nations (1990).

18. See for example, the matching of age patterns of mortality from the WFS data for several countries to various model age patterns of mortality in United Nations (1990).

19. Previous analyses of childhood mortality based on indirect methods for the Fiji censuses have all used the Coale-Demeny West model. See Bakker, 1977b; Zwart, 1979; Fiji Bureau of Statistics, 1989. However, these analyses do not look at the age pattern of mortality.

20. This is shown graphically in United Nations (1990).

21. The calculations of registered deaths, especially, must be considered too low. Brass used an unnamed standard for proportions of children dead, within age groups of women, that is markedly too high. There is also considerable smoothing of data.

22. Only ages 0-5 are used in this analysis as the Ministry of Health does not report deaths for ages over 5 years. In the Brass and Zwart analyses ages 0-9 were used based on data from the Registrar General.

23. See Feeney (1991) for a particularly interesting analysis using poor data.

CHAPTER III
INFANT AND CHILD MORTALITY 1896-1927:
GOVERNMENT PROGRAMMES AND FIJIAN RESPONSE

1. Introduction

The Colonial Government's response to the Decrease Report was as vigorous as it was initially alienating to many parts of the Fijian population. However, in the decades which followed the Fijians largely accepted the Government's health programmes despite the financial costs and additions to the burden of communal work which they entailed. This chapter analyses the medical and public health initiatives taken by the Government during the first three decades of the twentieth century and the Fijian responses to them. The aim is to suggest explanations for the decline in childhood mortality between the publication of the Decrease Report and 1927, the beginning of the Child Welfare Campaign.¹ In this period the IMR declined by half with similar sharp declines in child mortality.

Medical and public health provision at the end of the last century and the first decade of this century is described in Section 2, including the reforms of the activist Governor Sir George O'Brien. In these years the basic medical infrastructure and the public health objectives were established which would continue until after World War II. Section 3 describes the public health initiatives as they were carried out at the provincial level between 1910 and the late 1920s. Section 4 maps the disease environment and suggests the probable immediate causes of childhood mortality. Section 5 reviews the trends in the component childhood mortality rates in light of these causes and the likely effects of the government initiatives.

2. The First Decade

2.1. Medical provision at the end of the century

Sir George O'Brien succeeded Thurston as Governor in 1897 with instructions from the Secretary of State to "devote his whole and immediate energies" to the "question of native depopulation", which must be "radically treated" (CO83/64). The initiatives which followed were based on the Decrease Report and built on aspects of a rudimentary medical system which was already in place. The Colonial Hospital in Suva was a general hospital open to all races, and from 1886 was a centre for medical education, albeit limited in the early years. However, in the first decades after cession the Colonial Office in London had been unwilling to allocate additional funds for the medical

care of Fijians, despite the efforts of an experienced and progressive Chief Medical Officer, Dr.(later Sir) William McGregor (Joyce, 1971).

There was a small number of Western trained doctors, averaging 6 in most years between 1875 and 1885. To compensate for the lack of trained medical staff, Fijian Wesleyan mission teachers had been used as medical assistants as early as 1876 (Joyce, 1971). The arrival in 1879 of the first shipload of Indian indentured labourers, which was found to have a number of cases of smallpox on board, reinforced the acute need for a larger medical staff. McGregor's solution was to train a group of Fijian men as vaccinators while the ship was placed in quarantine. A year later McGregor estimated that fewer than 20,000 Fijians had yet to be vaccinated, of a population of 114,748. Impressed with the ability of the vaccinators both in carrying out the vaccination programme and in responding to minor medical problems, McGregor proposed giving the ablest of them medical training in at the Colonial Hospital in Fiji. Although the Colonial Office in London turned down the first request of the Fiji Government for funds for this purpose, the economic problems of the Colony and its inability to attract well-trained European doctors led to its eventual acceptance, and 11 men were selected for training in 1885. They graduated in 1888 and began work under the supervision of Dr. Glanville Corney (one of the three authors of the Decrease Report), who had succeeded McGregor. These "Native Medical Practitioners" were to be housed in a village and given a garden and "paid not less than five pounds a year by the Province, and, as Provincial Vaccinator, two pounds ten shillings by the Government (Guthrie, 1979)." They were to be "directed by the senior native official of the Province", although the Chief Medical Officer was their ultimate superior, and their work was to be inspected by the District Medical Officers (Guthrie, 1979).

The NMPs, who numbered 41 by 1915, became the core medical staff of the Colony, supervised and supported by an average of only 10 Western trained medical officers. In addition to preventive and curative health care, their other and certainly most onerous task was to serve as sanitary inspectors for successive governments. This role was to cause considerable conflict between the NMPs and the **Rokos** and **Bulis** with whom they had to work, and who in some cases had traditional authority over

them; the DMOs, some of whom felt they shirked their responsibilities in sanitary work; and the Fijian villagers who were often resistant to the measures proposed and the work entailed. Nonetheless, for its time, it was an inspired programme which spread Western ideas about sanitation and medicine throughout the Colony.

The public health initiatives for the Colony were based on an extensive system of Native Regulations. New houses, better water, and treatment of some medical problems were offered, but in a context of regulations which defined duties related to all aspects of personal and village life and carried with them, in some cases, fines and punishment for violations. Listing a few of these illustrates their pervasiveness. An 1885 regulation restricted women from carrying heavy burdens during pregnancy. Unmarried girls were prohibited from sexual intercourse, with a penalty of plaiting mats. An 1892 regulation made it illegal to prevent or delay marriages in which the full wedding gifts had not been presented. In the same year it became illegal for married women to leave their households and husbands without just cause. (These latter measures, it was hoped, would promote fertility.) Regulation No. 5 of 1892 made it a duty to report stillbirths and deaths under 1 year in the hope of encouraging inquests. Regulation 6 set a fine of 30 shillings or imprisonment for up to 3 months for the neglect of a child by "Any father or mother or other person whose duty it is to provide care for an infant or child..." Regulations in 1898 made special provision for inspection and quarantine in epidemics. Regulations were passed requiring smallpox vaccinations, and prohibiting the purposive exposure of children to yaws. This ad hoc set of public health regulations allowed inspectors into villages and homes, houses could be destroyed, mats (the essential "furniture" of the household) burned, and villages moved. Brewster (1922), reflecting on his long experience as a magistrate, recorded:

In fact it may be said that the Fijians were tied hand and foot by all sorts of enactments. That, however, was their own fault, as they hold endless councils and are fond of passing laws for themselves.

Sir Henry Jackson, shortly after taking up the Governorship in 1903, observed mildly to the Colonial Office that "the Natives are a little over-governed (Dispatch of 23 April, 1903: CO83/76)".

2.2. The O'Brien years (1897-1902)

O'Brien was the first of several Governors to question, with the encouragement of the Secretary of State, the principles which the Gordon-Thurston governments had fostered, especially Fijian self-administration and the continued support of communalism. However, he was perhaps more concerned with the health of the population than Thurston himself had been.

In his four years in Fiji, he implemented many of the recommendations of the Decrease Report and laid the foundation for the public health practices and the medical care infrastructure which would follow over the next several decades.² However, his zealous, sometimes imperious, manner and cultural insensitivity alienated the Medical Department, the Chiefs, many of the Fijian people and the Wesleyan mission (Macnaught, 1982). Thus the programmes, which those who had written the Decrease Report had hoped would relatively quickly reverse the trends in mortality, began with a government that promised too much too quickly and a populace that became disaffected.

The chief goal of the O'Brien administration's population programme is recorded in the Vital Statistics Report for 1901:

The betterment of the Fijian mother and her offspring, with a view to reducing the appalling rate of infantile mortality, is what we have been striving for... (CO83/75)

In line with the Decrease Report, the methods would include raising the standards of public health generally and specific programmes to improve child care and feeding. The early steps included improving water supplies and sanitation in the villages, improving the housing stock, encouraging the planting of coconuts as a food source, and introducing milk cows into Fijian villages along with the use of feeding bottles. In 1898-99 four European Provincial Inspectors were appointed to implement government policies and enforce the many Native Regulations, including those related to the conditions of women, which O'Brien believed to be "a dead letter" without European enforcement. This was acknowledged to be "a new and important departure" in native affairs, and reflected the administration's belief that what was required was a campaign designed to undermine the authority of the existing native administration; a campaign

against the results of the apathy and indifference of the native chiefs and officials, who have previously had such a great share in the administration of native affairs...[and in particular, in respect of the Native Regulations made but not carried out during the last 20 years where the

chiefs have been shown to be] unreliable and indifferent, and devoid of executive ability (Vital Statistics Report 1898: CO83/70).

Both the Roman Catholic and the Wesleyan Missions were persuaded to establish Hygienic Missions "for women of their own religion", causing the Native Commissioner to note publicly that "the Wesleyan Mission is at last waking ... from the apathetic and standstill policy which characterised that huge organisation for so long (Vital Statistics Report 1898: CO83/70)."

Impatient for results after only a year, and based on his reading of the diaries kept by the Provincial Inspectors, O'Brien wrote to the Colonial Office on 13 April, 1899, that it was now clear that the decrease of the population could only be arrested by provision of "rational medical treatment" for the natives (CO83/70). To this end he proposed, as a beginning, substantial expenditure on three provincial hospitals and doctors to run them. In 1899 he opened the first of these hospitals in Rewa (Map2). The Rewa hospital was to serve the provinces of Rewa, Tailevu and Naitasiri -- nearly a quarter of Viti Levu, with a native population of over 18,000. By 1902 there were five provincial hospitals under Provincial Medical Officers, who were made directly responsible to the Governor and separate from the Medical Department, for which O'Brien had little time: Rewa as above, a hospital for Ra, Colo North and East, and three more in Kadavu, Bua and Lau (at Lomaloma).³

The O'Brien programme was an ambitious one by any standards. The Vital Statistics Report for 1900 (CO83/72) reported five major schemes to improve water supplies and asserted that "in the course of two or three years it is not unlikely that every village in the Colony in need of good water will be provided for." On housebuilding it was recorded that, "Never in any year have so many houses been built.....The ordinary native no longer sleeps on the floor of his house." Regarding sanitation and cleanliness of the villages, "the results of their [the Provincial Inspectors'] labours are at once to be seen on entering a village where they have been at work." The 1901 Vital Statistics Report (CO83/75) reported many villages shifted to "more healthy sites" and pure water by pipes or catchment supplied to others; 4795 new houses and 4977 kitchens had been built, affecting perhaps as much as 25% of the housing stock.

While government reports recorded that this work is "gradually becoming appreciated by a larger number of natives each year (Vital Statistics Report, 1901: C083/75)", O'Brien's style threatened to have long term negative consequences in failing to gain the cooperation of the people in the health reforms. Brewster summed up the O'Brien period thus:

We were all infected with the Governor's enthusiasms and between us we worried the natives pretty considerably and the reforms got on their nerves ... under the new regime we were daily stirring them up and causing resentment... when Sir George left us I summed up the situation thus: Sir John Thurston had left the people actively loyal, and his successor passively disloyal (Brewster, 1922).

The conflict between the Provincial Inspectors, the magistrates and the Fijian villagers is captured in one incident which Brewster records. Under already existing regulations pigs in Colo East had been penned, but penned close to the villages. This was in itself a regulation which the Fijians resented. But under O'Brien's ruling pigs had to be kept some distance away from the village. "In disgust the people slaughtered the bulk of their animals, and consequently very considerably diminished their supply of flesh food..."

The chiefs also were angry with what were perceived as the high-handed methods of the Provincial Inspectors and wanted them withdrawn. In 1903 Sir Henry Jackson, the new Governor, replaced them with Assistant Native Commissioners. These were to carry on the supervisory work of the Inspectors, but would, it was thought, do so more effectively and with less resentment as part of the Native Department, for which the Fijian native administrators worked. In particular, Jackson observed to the Colonial Office that this arrangement would secure "more effective control over sanitation". In some cases their role was combined with that of the District Medical Officer (DMO).

The milk cow and bottle programme was another failure, as Brewster colourfully explains:

We were 'maids of all work'...we had to instil sanitary measures into the minds of the villagers, and teach them how to keep and milk cows... we had to give instruction to the native women upon how to use feeding bottles which happened to be the pet fad of one of the Governors ... we were a miserable failure over the feeding bottles... the women always declared they would never use them and they didn't... For a while we managed to keep the cows going and milk distributed, but it meant too steady and constant application, altogether out of keeping with the Fijian bent. This phase of the reforms died out from sheer

fatigue on our part to keep it going (Brewster, 1922).

The Hygiene Missions too were given up when it became clear that this would have to be a permanent programme, since households and villages tended to slip back into their former states of uncleanness and lack of sanitation without supervision (Macnaught, 1982).

O'Brien also had personal and administrative differences with Corney, his Chief Medical Officer. Corney was, in effect, sidelined as head of the Medical Department and was, in his own words, "not taken into the confidence of the Governor" in respect of the O'Brien reforms, although he had himself been involved in proposing them in the Decrease Report and elsewhere.

However, there were some enduring legacies of this intense period of public health programmes. O'Brien had marshalled greater support for medical reform than his predecessors and had a greater commitment to public health than some of his successors. Sir Everard im Thurn, who succeeded Jackson, did not share O'Brien's interest in health reforms or his zeal, and believed that natives in other colonies were significantly worse off than Fijians.⁴ The Gordon-Thurston years had caused controversy within the Colony and in London, where officials had been suspicious of the policy of "indirect rule", and welcomed the opportunity for greater intervention in Fijian affairs offered by Thurston's death in 1897. It is, therefore, unlikely that support for the health-related programmes which occurred under O'Brien and which involved the expenditure of large sums of money would have been given to Thurston.

In part the legacies of this period were lessons for the Government -- lessons on the speed of social change which could be expected, the role of the Fijian administration in creating support for and enforcing public health measures, and the willingness of Fijians to change aspects of their traditional culture. Although in the next decades changes were to come in almost all areas of public health for which O'Brien had sought change, they came slowly and with some resistance.

It had become clear to the Government that working with the **Bulis** and **Rokos** was essential if lasting changes were to be made in village life. In 1902, Allardyce, the Native Commissioner, sent to London his own translation into Fijian of all outstanding Native Regulations, which had been indexed and given to native magistrates, **Rokos** and **Bulis** (CO83/74). In 1903, Jackson

appointed a mixed European and Fijian commission to revise the Native Regulations (Dispatch of 23 April 1903: CO83/76). This change to a more cooperative approach between the Government and Fijian leaders would be of considerable importance in the administration of the sanitation programmes especially, as these involved direct interference in village life. In many areas of public health enforcement the medical professionals, chiefs and the Fijian administration came to share responsibility for enforcing public health legislation; the yaws regulations are another example. In 1903 a comprehensive regulation enforcing the compulsory treatment of yaws was passed with special reference to children and at the "unanimous request of the chiefs (Dispatch of 20 May 1903: CO83/76)." Parents had a duty to report any case of yaws "forthwith to the **Buli.**" **Rokos, Bulis,** and **MOs** were given power to order yaws cases to the provincial hospitals for treatment.

2.3. Development of the health infrastructure

Between 1903 and 1910 the system of medical provision was established which would stay in place until the late 1920s, only then to be enhanced by the Child Welfare Campaign. The provincial hospitals had been an almost immediate success. Within a year of their establishment the Acting Native Commissioner reported that "natives willingly present themselves for treatment" (Vital Statistics Report 1902: CO83/77). By 1905, there were 8 provincial hospitals for native Fijians, with 3,333 admissions and 15,511 outpatient cases for an estimated Fijian population of 86,816. The 1905 Vital Statistics Report noted, however, that while "The provincial hospitals continue to be extensively patronised by the natives...It was not to be expected that these institutions would at once displace the influence for centuries exercised by the wiles and cunning of the native medicine man (CO83/82)." Under Jackson's administration, the hospitals were brought under the control of the Medical Department, and Corney swiftly moved to integrate the NMPs and DMOs into provincially based medical teams. In 1908, recording again that the "death rate among children is far too heavy", the Native Commissioner reported the beginning of a new programme for training native midwives, to be known as Native Obstetric Nurses (NOBN) (Vital Statistics Report 1908: CO83/92). The scheme was to train "intelligent native women in midwifery" who would be sent to work touring the provinces. Their job was both to

educate women, especially pregnant women, in the proper care of themselves and their infants and to break the hold of the native midwives or "wise women" on the medical care of mothers and children. (Such a scheme had been first proposed in the Decrease Report.) The NOBN would advise on work and diet during pregnancy and lactation, safe delivery, care of the newborn infant, infant feed and hygiene. Corney had tried to effect some of these changes by writing a series of pamphlets in Fijian on childbirth practices and infant care. (Two of these were reviewed in the British Medical Journal on May 16, 1903). Evidence suggests that the traditional midwives had retained their position despite attempts to re-educate them, the "strong condemnation" of the medical officers, and in a few cases prosecutions. In 1908 four NOBNs were sent to work in the provinces and their numbers grew over the next two decades.

By 1910 the basic health care infrastructure was in place with a system that focussed on both curative and preventive care. Medical provision for Fijians included the Colonial Hospital in Suva (which treated all races); provincial hospitals; European trained doctors working as administrators and inspectors and in primary care, including in most cases travelling in the provinces; native medical practitioners and native obstetric nurses. This provision is summarised in Table III-1.

While these numbers suggest relatively high levels of contact with medical health professionals and substantial use of hospitals, the categories in this table were not defined in any of the Medical Reports. For example, it is not known what constitutes an "outpatient"; presumably each visit is a separate event. Thus the same person might be seen several times for a single condition. Equally it is possible that different treatments in the same visit were added in separately, for example, to numbers in different clinics. The very large number of NMP cases seen in relation to the size of the population is also difficult to interpret. It is possible that it includes, for the early years, some or all of the outpatients seen at provincial hospitals and dispensaries, as well as those seen on village rounds. And these large numbers are, in part, explained by the role of the NMPs as smallpox vaccinators. Thus in 1915 there were 4,043 vaccinations given, probably largely in the villages.

Table III-1
Medical Provision for the Fijian Population, 1910-1935

Date	1910	1915	1925	1930	1935 ¹
Provincial Hospitals Number ²	10	11+	12+	12+	12+
Admissions	3901 ³	4857	3566	5386	3388
Outpatients	9561 ⁴	13647	17607	15924	33156
Colonial Hospital Admissions	2120	1615	1434	2803	2713
Outpatients	--	--	--	--	14561
Lautoka Hospital Admissions				1645	2335
Outpatients				3468	7298
Native Medical Practitioners	36	41	46	48	60 ⁵
NMP cases seen	35622	25200	26251	33682	37358
Native Obstetric Nurses	12	17	24	53	50
Estimated Fijian Population ⁶	87096	89562	88431	92189	97651

¹ By 1935, hospitals were increasingly treating all ethnic groups, and substantial proportions of Fijians were treated at Suva and Lautoka. Provincial Hospitals largely treated Fijians.

² In 1910 there were Provincial Hospitals for Fijians in Ba, Cakaudrove, Macuata, Nadroga, Ra, Rewa, Bua, Lau, Kadavu and Levuka. By 1915, a further one had been added in Savusavu, and three smaller hospitals in the islands of the Lau group. In 1925, a twelfth Provincial Hospital had been added in Colo East, and there were other smaller hospitals and dispensaries. Admissions refer to Provincial Hospitals. There was also a hospital in Rotuma, which is not included in this table, since few Fijians lived there.

³ In addition, 1756 cases were treated at the Lau Hospital, which did not yet have in-patient facilities.

⁴ Number for 1911, the first year in which it is reported.

⁵ In addition, there were 5 Indian Medical Practitioners.

⁶ Numbers from the 1911 Census (1910); Vital Statistics (1915, 1925 and 1930); and the 1936 Census (1935). These do not include Rotumans.

Despite these reporting ambiguities, Table III-1 suggests that a large proportion of the Fijian population would have come into contact with a medically trained professional in any one year. What cannot be established is the number of children treated either in hospital or in the villages. There is no reporting for either by age. And there is no systematic reporting of the numbers of births which were attended or of antenatal visits, and little reporting at all on the specific care of women and children.

There was clear resistance to some types of health care. While people came in large numbers for yaws treatment, many resisted coming for treatment of dysentery (MD1911) and

tuberculosis. In part this may be explained by access, which for many was largely by water. Many of those who came to hospital for yaws treatment were relatively well. Transporting the seriously ill would have been difficult. Those with tuberculosis may have feared being detained for long periods against their will.

Although anecdotal, the initial resistance to the NOBNs in many parts of Fiji is also clear from the medical reports. This might have been predicted given the resistance which many Fijians had earlier shown to the work of the Provincial Inspectors and the Hygienic Missions (see Macnaught, 1982). However, in some areas the NOBNs were successful. The Ra provincial report for 1914 suggested that a quarter of births were "attended" in hospital and that the NOBN had also "toured the province". A similar report for Kadavu (MD1913) indicated that a maternity wing was to be added to the provincial hospital in the following year. The following reports were, however, more typical of the early years:

1910 299 cases [births numbered 3377 in this year] have been attended by them in the provinces [this would have included births in hospitals as well as at home], which vary much in their appreciation of the nurses' services.

1911 (Labasa) ... [the NOBN] toured the province ... [she has] done her best to inculcate better ideas, as to midwifery and the management of infants into the minds of the still very backward Macuata women, but they do not really prefer her services to those of their own old women, and she has only been able to attend three confinements.

1912 (Ra) It is not easy to get people to make use of services of nurses during their confinement...but nurses try to teach women how to feed their children, a very difficult and thankless task.

1913 (Ba) ... [The NOBN] attended 8 births owing to the still existing native dislike of new methods.

1915 NOBNs do not remain long in the service. They marry very soon after leaving the hospital and resign... Their training is probably of use to them and to others even after they give up their work.. 56 in all have been trained and sent out since 1908 of whom 39 have left the service for one reason or another.

The sharp decline in both stillbirth and neonatal death rates shown in Section 5 suggests that this programme may have been more successful than these relatively early reports suggest. Those NOBNs who left the service returned to villages where their knowledge and experience may have been influential. Despite the

high attrition, the programme had considerable support. A Select Committee on the provision of native health workers suggested that these were "an indispensable body" and that "it was in the interest of the Fijian natives" that their number should be increased in the case of NOBNS to 100, almost double that for the NMPS (CP102/1913). In some provinces the system developed as planned and NOBNS worked in the hospital alongside the NMPS and DMOs and toured the districts (MD1913). However, in relation to childbirth many women were slow to accept the NOBNS. Anecdotal evidence suggests that most Fijian women did not have problems giving birth. Women who did were making their way to the hospitals in small numbers, most "because they had something wrong with them such as frequent miscarriages or stillbirths (MD1916)".

A large part of the work of the NMPS and DMOs was in inspecting the villages and enforcing the public health regulations. Given the limited chemotherapies available in this period and the apparently slow progress in promoting antenatal and infant care, it was this work which had the greatest potential to affect childhood mortality. An analysis of these public health programmes is almost entirely dependent on the documentary evidence found in the provincial medical reports. The evidence is analysed in the following section.

3. Public health programmes, 1910-1930

3.1. Introduction

The efforts by the Colonial Government in this period to improve sanitation, water supplies and housing were based on the best public health knowledge of the day, including what was known about disease transmission.³ Based on the effects of public health programmes in developing countries today, it can be assumed that these public health initiatives will have made a significant contribution to mortality reduction in this period. They would have been of greater importance than the medical provision, given the few medical interventions which were available. However, the evidence to assess their contribution is limited and the evidence does not exist to quantify the effects of the initiatives, as might have been possible if, for example, programmes were carried out in only parts of the country. It was a strength of the Colonial Government that its programmes were colony-wide.

Over time the initiatives met with fatigue and resistance on the part of Fijians faced with continuous demands to maintain standards of hygiene which had no *prima facie* relationship to their health problems, and which necessitated a change in patterns of living and behaviour that probably seemed to have served them well.

The sanitary campaigns in developed countries (Great Britain is a good example) also met with controversy, in terms of the intrusion on individual rights and the lack of scientific agreement on the causes of epidemic disease, and also provoked resistance (McNeill, 1977; Brockington, 1965). However, once water and sewer pipes were laid in Britain, they did not rely on individual initiative for maintenance and replacement. These community services existed in the public domain. The same could not be said of the efforts to create clean water supplies and provide for waste disposal in Fijian villages. Floods and hurricanes destroyed or disrupted the provision for both. Drains and latrines were worn by use. Houses and kitchens required frequent rebuilding. Adequate provision for public health in the tropics required continuous and time-consuming efforts on the part of villagers working individually and together. And whereas fear of cholera motivated communities in Britain to overcome resistance to social change on their behalf, there is no evidence that the same types of fears motivated the Fijian people (in contrast to their paternalistically motivated Colonial Government).⁶ On the contrary, the Fijians had lived for decades with extraordinarily high mortality and the link between the demands for hygiene and this mortality probably seemed highly dubious.⁷

Colonial administrators were slow to recognise that housing and sanitation reforms, carried out so successfully in European cities in "bricks and mortar", would not endure in a tropical environment. Allardyce, Acting Governor in 1901, noted with concern after inspecting up-country housing improvements that, "the life of an ordinary native house being only 5 or 6 years", the presence of hurricanes and other natural disasters would mean that annual financing for new houses would be needed (CO83/72). Expensive provincial improvements in water supplies were at times destroyed in a few days. Rewa province, which during the O'Brien years had received considerable and disproportionate resources for housing and water supplies, suffered from severe floods in

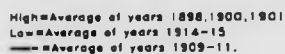
1901, undermining much of the work which had been carried out. Providing good sanitation had become a permanent problem of village life, contrary to the likely expectations under which the Fijians had worked to conform to the many government requirements. The Council of Chiefs address of farewell to O'Brien suggested that their perception was that the task was finished. They thank him for "good drinking water"... and report that "our towns are now in a sanitary state... and we are well off generally (C083/72)".

With the limited evidence available, the analyses in the following section illustrate the progress in public health programmes, especially those concerned with sanitation, between 1910 and the late 1920s by briefly analyzing the reports from the DMOs in three provinces (Bua, Lau, and Ra), and, more generally, the public health goals and obstacles to their achievement.

3.2. The provincial context

By 1910, after a decade of public health programmes, all the provinces, with the exception of Lau, had seen a decline in mortality from the beginning of the century. Figure III-1 shows the variation in the decline in IMRs for 14 of the 17 provinces from the beginning of the century to 1910 and between 1910 and 1915, the last year for which these provincial rates have been located.⁸ The provincial rates in 1900 varied considerably, reflecting local conditions, the relative isolation of populations, and perhaps differences in provincial levels of education. To some degree these "starting rates" may also reflect poorer reporting of ages of death in some provinces. The very high rates found in Bua, Ra and Colo West were about 45% higher than those in the few provinces with **relatively** (and relatively consistently) low rates -- Lau, Kadavu, and Rewa. The latter had had long associations with Europeans, especially missionaries, and this is reflected in the levels of literacy in these provinces, which were high even at the end of the first decade of the century (Table III-2).⁹

Variation in the Decline in Infant Mortality by Province (1900-1915)^a



Fijian Provincial IMRs
1894 - 1915
(Selected Provinces)



Table III-2

Literacy in Fijian.
(Percentage of Fijians over age 15 Able to Read and Write)
Selected Provinces

Province	1911(M+F)	1921(M)	1921(F)	1936(M)	1936(F)
Viti Levu					
Rewa	74	81	81	91	83
Tailevu	70	82	79	83	84
Ra	46	56	54	63	65
Colo West	58	67	60	90	82
Vanua Levu					
Bua	53	67	63	80	76
Macuata	56	57	54	74	67
Smaller Islands					
Kadavu	74	80	83	87	88
Lau	81	90	87	92	92
Total	66	76	72	87	81

Source: Fiji Censuses, 1911, 1921, 1936. (See Appendix C).

The mean, standard deviation and coefficient of variation for all 17 provincial IMRs in the two time periods which begin and end each series described in Figure III-1 (for 14 provinces) were as follows

	Mean	S.D.	C.V. (S.D./Mean)
1898-1901	332	74	.221
1914-1915	198	41	.208

Although there was little change in the variation in mortality rates between the beginning of the 20th century and 1914-1915, reflecting a lack of convergence in rates around a single point, a majority of the provinces were at or below the rate of 200 by 1914-1915 and 3 were between 201 and 220. The IMR in the next reported year of 1923 was 168 for the Colony as a whole. The variation in the rates and degree of decline in infant mortality is likely to have reflected the different levels of administration and development in different provinces, differences in reception of government programmes, localised hardships resulting from natural disasters such as hurricanes and drought, and different localised outbreaks of diseases in any

given year. More detailed trend data are shown in Figure III-2 for the three provinces analysed below.¹⁰ They illustrate the different patterns of mortality decline even in a relatively small geographic area such as Fiji.

Beginning in 1910, the annual medical reports included reports from the District Medical Officers (DMO) on the medical and public health work in the provinces (in some areas more than one province was covered by a DMO). The reports covered their work and, more briefly, that of the NMPs and NOBNs. They recorded major epidemics as well as endemic diseases and assessed the "sanitation of the native towns". These provincial reports documented the progress or lack of it in bringing about compliance with government policies.¹¹ They built on reports from the NMPs but were in all cases written by a European medical officer, in whose absence there was apparently no report. They vary in length, detail and quality; and they reflected, in some cases, the personality of the DMO and his job satisfaction. But the majority were summary medical reports of a reasonably professional kind. A number of DMOs had long careers in Fiji and moved from district to district as needed; their reports provide a particularly useful anchor for a given period.

The reports for three provinces are briefly summarised here. The provinces were chosen because in two cases, Bua and Ra, they had unusually high levels of reported mortality in the late 19th century and show the greatest improvement in rates. Lau was chosen because it illustrates some of the difficulties in achieving effective sanitation and water supplies in an often hostile physical environment and because of its geography -- a province of widely scattered islands. The three provinces also had a series of reasonably well documented reports.

The evidence related to public health initiatives from these reports is largely qualitative and undoubtedly has biases. As with any progress report the incumbent of an office must appear to be carrying out effectively the work for which he is responsible. Thus there is a need to reflect improvement. The time spent on each part of the job, (e.g. sanitation or medical care) is likely to have varied, reflecting personal interests and energy. Perceptions of the state of villages were undoubtedly subjective. One inspector's "fairly good" can be another's "excellent". But reports which were consistently wide of the mark would have come to light as other government officials

visited the area concerned. The reports would in most cases have been based on the observations of the DMO and usually several NMPs, all of whom had responsibility for village sanitation; analysing these reports for the same province over several years itself provides a check on the subjectivity of any one report. What gives these subjective reports their validity is the fact that those working in the field would have common expectations of what sanitary work was to be carried out in the villages. These expectations had become well-defined over time as expressed in regulations and practice from the end of the previous century.

There were to be sufficient houses (as defined by the medical teams) which were weather-proof, well ventilated, and well raised from the ground. Each village was to have numbers of latrines, placed away from drinking water, and kept in good order. Rubbish was to be burned or buried. Swamps were to be drained and drainage was to be in place around the villages. Pigs were to be fenced or at least kept out of houses. Land around houses and around the villages was to be kept cleared. Mats were to be kept cleaned and burned where there had been serious illness. Areas were designated as appropriate for the water supply and piping or concrete storage containers were installed where necessary (in later years usually at the expense of the villagers). In addition an attempt was to be made to educate villagers about spitting under mats and in other unsuitable places. Yaws cases were to be sent to hospital.

In an attempt to rationalise the public health regulations for Fijians, to clarify responsibilities and increase enforcement powers, the public health regulations for native villages were re-written and a new ordinance applying only to Fijians came into effect in 1915. The Native Health Regulations of 1915 (CP15/15 in C085/21) brought all of the previous policies, practices and pre-existing regulations into one act. They included homesites and dwellings, giving detailed specifications on type of foundations, numbers of doors and windows, types of flooring and covering, provision for raised sleeping places and separate kitchens. Powers were given to pull down houses which were deemed unfit. Notifiable diseases were defined and powers given for the isolation and quarantine of individuals and areas.

Written in Fijian and distributed to Fijian administrators, medical staff and others, the regulations gave considerable power to District and Provincial Commissioners, DMOs and **Bulis**. In turn

the **Turaga ni Koros** and **Bulis** were made responsible for carrying out related orders and were to incur a penalty for failing to do so.

For the Colony as a whole, inspection, health education and enforcement of regulations took place in over 1100 villages. By 1910 there were 36 NMPs and 10 DMOs covering the 17 provinces. The Fijian population lived in small, dispersed villages typically along the coast or inland along rivers. In 1911 there were, according to that census, 1128 villages of which 906 had populations of under 100, and only 15 over 200; in 1921, 1099 with 909 under 100 and 12 over 200. Although the Government had tried from the earliest days to consolidate villages for health provision, this met with resistance and only rarely occurred. Each provincial study begins with a description of the geographic context and the size of population.

3.2.1. Bua

The 1911 census estimated the population of Bua as 3658, living in 56 villages of which only 7 had a population larger than 100; in 1921, 3457 people lived in 51 villages, with only 5 over 100. Villages were dispersed over a third of the island of Vanua Levu, more numerous along the coast but some located inland along the larger rivers. As in Viti Levu, the interior is mountainous and in 1910 only poorly developed paths linked the interior villages with the sea; travel both inland and along the coast was carried out largely by water. Although the village population declined by almost 25% to 2882 between 1911 and the census of 1936, small dispersed villages (now 52, of which only one had populations over 100) remained the form of community organisation.¹² The provincial hospital for Bua was opened in 1910. After 1910 there were 3 NMPs in most years and in some years there was also a NOBN. For its relatively small population, Bua was given disproportionate resources, perhaps because of its history of high mortality.

Arriving in Bua in 1910, the District Medical Officer, who had some years' experience in Fiji, noted that the villages were in better condition than he expected, although he wrote "much needs to be done in the way of housebuilding, repairing, swamp draining, latrine building etc. before the province can be said to be in anything like good condition (MD1910)". The adequacy of village sites, water supplies and latrine arrangements varied, some were "low lying villages with leaky houses not raised from

the ground" where there was "much disease" (MD1911). These differences were largely explained by the quality of the local Fijian administration:

Where the Buli of the district and the ... chiefs were active men with some power over their people, I generally found the villages in a satisfactory state but one does not find that class of man all over the province by any means.

Even in the better maintained villages progress was limited by the gap between the beliefs of the medical authorities and those who had responsibility for effecting changes:

Talking about mosquito-borne disease to a Buli or Turanga ni Koro will often bring forth the usual Fiji expression of surprise at the depth of one's knowledge but in his heart he believes it to be nonsense and he will drain his swamp when he is made to, but certainly not before (MD 1911).

In 1912, Bua and nearby Macuata were struck by one of the most severe hurricanes of several decades, which left the provinces devastated and in need of food supplies. The work of the preceding years was seriously set back, but by a year later much of the repair and sanitary work had been carried out and "little disease of an epidemic nature" was reported. Frequent inspections of native villages were made by NMPs and the DMO, allowing the latter to "point out in detail to the **Roko** what needed doing in the villages" which he was "invariably" willing to have carried out promptly. Although as he noted:

[Although] surprise visits to native villages are often of a very disappointing nature there can be no doubt that the sanitary condition of most of the villages has considerably improved during the last few years. But as far as house building is concerned it is most difficult to get good work done (MD1913).

The 1915 report described the year as "a remarkably healthy one". Regular inspections showed that the water supply to certain villages was "as bad as ever", but "generally speaking the villages were fairly well kept."

In 1918, it was reported that sanitation was greatly improved with the "vigorous enforcement" of the new Public Health Regulations, but noted that they were sometimes carried out "unwillingly and therefore imperfectly." Inspections, threats of penalties for non-compliance and attempts to bring villages with poor sanitation and water supply up to the standard of other villages made up the sanitary work of the medical teams for the next decade.

Bua had probably changed little when Quain (based on his

field work in Bua in the 1930s) wrote that the growth of the Fijian population probably owed its existence to the health and sanitation programmes carried out by the NMPs and DMOs. However, he writes of his somewhat remote area of Bua at that time:

the observance of ...sanitary laws [in the inland areas of Bua] is done in fear of punishment and without understanding. When an official is seen to approach the village, there is a tremendous scuffle and din while the children scurry in and out of the houses...to catch pigs and carry them squealing to their pens. Sometimes a pig is overlooked, and there is a fine...[Similarly, health regulations related to diseases] are observed as a magic ritual to appease the colonial administrations and avoid the supernatural curse of disease (Quain, 1948).

3.2.2. Ra

The public health work in Ra, like that in Bua, must be seen as a considerable success. One of the largest provinces both in population and land area, it included over 65 miles of coastline and extended deeply into the interior. The population in 1911 was estimated at 6126, living in 86 villages; in 1921, 4965 living in 81 villages, and in 1936, 5171 living in 73 villages. Only 12 villages (13 in 1936) had populations larger than 100 and all were smaller than 200. Between 1910 and 1925, 3 NMPS and 1 NOBN typically worked in the province, increasing after 1925 as the numbers of trained native medical professionals increased.

Negative reports on population growth in the province appear in reports in the years following cession. The Vital Statistics Report of 1899 noted:

Ra...always comes out badly. It cannot be the water as it is well favoured in this respect. The Provincial Inspector who is a medical man sets it down chiefly to bad housing and the want of civilizing influences among the women (CO83/71).

Ra benefitted from the O'Brien initiatives and the work in Ra -- and in the Colony more generally -- was described in a speech in London in 1900 by the Ra Provincial Inspector, Dr. Morgan Finucane¹³:

...It can be said after eighteen months' experience with the new method that the changes it has brought in such a short time amount really to a revolution in things Fijian, bidding fair to ameliorate the condition of the natives in the near future...[including] the isolation and treatment of contagious endemic diseases; the establishment of provincial hospitals in the natives' midst with competent European medical attendants...the abolition of native customs where prejudicial to public health and progress,

and the practical enforcement of the excellent native regulations which in the hands of an indifferent native administration have been virtually dead letters up to now... (Finucane, 1900).

In fact, the "new method" provoked a good deal of conflict, as we have seen.

In 1911, it was reported that the great majority of houses were clean "although promiscuous expectoration does not help"; the water supplies were "quite good"; a new design of earth pit closets with an instruction programme has been introduced; and old houses were being demolished and new erected with "windows in most recently erected houses".

The 1912-1913 reports showed native town sanitation to be "quite good" and the water supply "as a rule good" but latrines not always well kept or used. The 1915 Report indicated that in the districts visited the villages were in "good condition" with respect to sanitation and water supply despite a devastating hurricane in 1914 which had left no native town without serious damage and some "almost wiped out" (MD1914).

The better DMOs and Native Practitioners explained the need for sanitary regulations as well as enforced them. In 1910 the DMO wrote, "My main efforts have been directed towards instilling into the natives the necessity for improvement in sanitation, hygiene and the means to be employed to attain that end." And in 1911 the medical staff had laid "Much stress ... on the terrible infantile death rate and the consequent decrease of the race." Attempts were made to teach "about the role of flies and mosquitoes in the spread of disease." The native nurse toured the province and talked to women about infant feeding and care and was generally well received.

The war years, 1914-1918, and years immediately after would be telling in demonstrating the degree to which the pressure for nearly two decades of conformity to Western norms of sanitation had achieved its goal. Because European trained doctors were difficult to recruit, the NMPs were increasingly the dominant force in medical and public health care. However, during the 1918 influenza epidemic a quarter of the NMPs died. In 1921, Ra had only 1 NMP and no NOBN. Thus at least minimal norms must have been accepted in the villages, if standards were maintained, as they seem to have been. The DMO in 1921 wrote, "The towns are generally well kept in good order and well weeded and well provided with suitably placed latrines." But not

surprisingly, since this was also the case in earlier years, "there are, however, some villages neither well situated nor well supplied with good water." The IMRs for Ra, some of the highest recorded, declined by over half between the beginning of the O'Brien period and 1914-1915. By the late 1920s the speed of acceptance of new government health initiatives was such that Ra was one of the Government's exemplary provinces in the Child Welfare Campaign.

3.2.3. Lau

Lau comprises a group of many widely scattered islands, of which 22 were inhabited in this period, in an area of 250 miles from north to south and 150 miles from east to west. In 1911 there were 71 villages with a combined population of 6590; in 1921, 7326 people in 73 villages; in 1936, 8756 people in 73 villages. 10 islands had only one village. The villages were larger than average: in 1911, 31 over 100 (and 3 over 200), in 1921 35 over 100 and 4 over 200, and in 1936 42 over 100 and 9 over 200. In 1915 there were 5 NMPs assigned to the province, and 6 by 1930. Lau was well provided with hospitals: by 1921 it had a provincial hospital, 3 smaller district hospitals and a dispensary.

Lau had, by the late 19th century, had nearly 50 years of contact with missionaries and Western traders (Garrett, 1982). The level of literacy was relatively high. Lau province might therefore have been expected to show an early reduction in childhood mortality. However, between 1900 and 1915 there was an increase.

Lau suffered from repeated hurricanes and periods of drought in the period 1910-1915. The effects of the 1910 hurricanes are summarised in the MD1910 where the DMO recorded that "there has been more than the average amount of epidemic sickness prevalent." Of the four "chief" diseases, three, dysentery, diseases of the digestive system and respiratory diseases, all started to increase:

...immediately after the hurricane at the end of March (which was particularly severe in this island [Lomaloma] and adjacent ones), and reached their climax in May, pointing very conclusively to the bad effect a hurricane has in 1.leaving heaps of decaying refuse, which undoubtedly contaminate draining water; 2.producing a scarcity of native foods, which results in the people eating impure and non-sustaining substitutes; 3.destroying and damaging houses, allowing the interiors to get damp, and inducing respiratory diseases among the inhabitants;

4.causing a great increase in flies and mosquitoes among the stagnant water and rubbish heaps, with a resulting increase in mosquito and fly-borne diseases (MD1910).

The combination of hurricanes and droughts produced considerable hardship. Keeping continuous clean water supplies had been a recurrent problem on the small islands of Lau. In the decade 1900-1910 concrete water tanks had been constructed which were "free from faecal contamination" but which depended on rain water. During the droughts, water supplies were exhausted and people depended on coconuts for drinking; the only available water being "brackish and muddy " and known to lead to digestive disorders (MD1915). However, the effects of the hurricanes on the supply of coconuts was felt most seriously in the following year, affecting their availability for drinking, as a food source and to provide for exchange of foods from other districts.

The Lauan response to the sanitary campaign had been disappointing:

Unless they are continually under the supervision of a European officer, working through one of their own chiefs, it is impossible to make the natives effect improvements in the sanitation of their villages. The Lauans from their close association with the Tongans might be expected to be cleaner in their habits than other Fijians, but it appears unfortunately that such is not the case (MD1914).

The Lauans, too, had been slow to accept the services of the NOBNS. The DMO records in 1914:

The work of the obstetric nurses in Lau has been seriously handicapped by the Lauans, who make very little effort to appoint girls from their own province to do the work while they resent and give no help to girls appointed from other provinces.

And in 1915:

[the nurses] have done as well as they could through the Lomaloma and Lakeba districts..., but the people do not call them in as much as they should do.

The 1921 report, a detailed and professional one from a DMO who was also District Commissioner, showed some progress. Ditching around the villages for drainage was good but ditching did not solve the drainage problem of low lying sites. Houses were found to be in good repair and sufficient in number but some households included as many as 8 members in one large room. Latrines and mat cleanliness varied from "good to the very bad". Conditions differed from island to island. Lakeba island, with 1000 people, was reported "full of sickness" despite a hospital,

while the general health and good sanitation of Moala island with a population of about 600 was attributed to the good work of the NMP who worked from his own house (MD1921).

Not until 1930 did the province receive a reasonably good report:

...villages as a whole have been kept in a...clean and sanitary state--drains regularly attended to, village borders properly weeded, houses and kitchens in a fair state of repair ...latrines which have been a great source of trouble in this province in the past... are beginning to improve and conform to what, in medical opinion, is safe for their use (MD1930).

Lau, with its widely scattered large and small islands, was an undoubted challenge to the medical administration. Although this was a period in which several ethnographies were written they offer little insight into medical provision and sanitation. This in part results from the conflict created for anthropologists in trying to document traditional practices in a changing world. Thompson (1940b) wrote of her work on the islands of Southern Lau in the 1920s that it was "an attempt to record the most important aspects of the native culture of Lau as a whole before they disappear." Thus it is the traditional aspects of medicine and social life that she documented, noting only in her later work (Thompson, 1940a) that the NMPs

...have a high social prestige among the natives, and by interpreting modern hygiene and medical practices to their own people they bridge the wide gap between native custom and Western science.

she observed that the small and distant islands in her study were visited by medical professionals as rarely as once a year, relying largely on traditional medicine. These remote Lau islands might have offered evidence of the variation in the implementation of public health initiatives that is needed to examine more fully the impact of medical provision and sanitary control on morbidity and mortality. However, they were not visited frequently enough for inclusion in the government reports and anthropologists were more interested in documenting native medicine and traditional practices than Western medical care.

3.2.4. Conclusion

The evidence from the provincial reports illustrates the difficulty of maintaining Western public health standards in a physically hostile environment. It shows the need for the active co-operation of the native administration and the continued resistance to change, or inability to effect it, on the part of

some of the villages. The difficulty of administering and enforcing the public health regulations was, in part, a result of limited manpower working with a widely dispersed population. In the face of all these difficulties, however, a substantial number of public health initiatives were apparently successfully established.

3.3. Sanitation programmes, 1920-1930

While all provinces benefited from the public health initiatives between 1900 and 1920, and in most villages the positive changes appear to have been maintained into the next decade, the difficulties in keeping up the pressure on the native administration and, in turn, on villagers became apparent in the reports of the 1920s. These pressures were added to an already full and rigid programme of other communal duties for Fijians. The provincial courts were burdened with prosecutions related to all of these - violations of health and sanitation regulations, regulations related to other communal duties and unapproved absence from the village. As an example, of the 265 cases dealt with by the Colo East provincial court in 1921, 61 involved failure to perform some communal obligation, 48 involved the breach of native regulations, and 28 involved absence from the villages (Lal, 1992).

The effects of young men leaving the villages are apparent from a number of the provincial reports in this decade. As examples, the report for the Savusavu district, 1921, noted the "appearance of decay and desolation" in almost every town; that water was poor in many places, although the people were trying to raise money for a better water system; bures "were falling into decay for want of labour to repair them", and "there appeared to be an absence of able-bodied men in the towns" (MD1921). From Taveuni in 1925 it was reported that "people to a large extent have lost interest in their towns owing to the fact that a large proportion of young and vigorous men now leave their villages" (MD1925). The 1928 report from the island of Nairai in Lomaiviti noted:

This island was in a most unsatisfactory condition. The water-supply is bad in most towns, the latrines were dilapidated... Yaws was rife... The young adult male population ... had signed on to work in other districts, leaving only old men, women and children to carry on. Eye trouble was common and flies abounded (MD1928).

The unequal distribution of physical provision was apparent from numbers of reports, most often in relation to water supplies. For example, in Savusavu in 1928, although the villages were clean and latrines plentiful, "the great hardship in many villages is the lack of a good water-supply." During periods of drought people in many areas "have to carry their drinking water over a mile (MD1928)". Some villages in this area were without fresh bathing water for many months. In most cases money had to be raised for improvements to water supplies, rather than coming by direct support from the Government, and this favoured the more well-off villages and areas, and those with better administration.

The pressures of what were probably changing (and increasingly higher) standards of hygiene and sometimes unwilling manpower led to resistance on the part of some in the native administration. In Ra, both the 1928 and 1929 reports indicate a lack of cooperation between the NMPs and the provincial administration:

I can safely say that native chiefs take very little interest in this all-important subject; travelling native medical practitioners in many towns are more or less obstructed in their work through the ignorance of the men in charge of these towns (MD1929).

Coulter (1942) writes of this period:

The time has gone when obedience to chiefly power was involuntary...Fijians now distrust or oppose the orders and supervision of their chiefs in planting and weeding native gardens...Nowadays...native magistrates are called on more and more to deal with offenses against the communal system.

During the 1920s a number of sanitation campaigns were undertaken, usually in response to an outbreak of disease or a localised health problem. These included the Ankylostomiasis Campaign, supported by the Fiji Government with aid from the Rockefeller Foundation (see Section 4.4.3 below) and the sanitation and vaccination programmes to control typhoid in Suva and Rewa in the mid-1920s. Preliminary work was carried out for another Rockefeller Foundation project to develop a "bore-hole latrine pit system". This was to be an important technological advance, as latrines had been located over the sea or elsewhere outside villages. The new latrines would be closer to houses, there would be more of them and they would be semi-permanent rather than requiring regular renewal. The project was not under way in Fijian villages until 1928.

3.4. Conclusion

While this qualitative and somewhat anecdotal evidence gives only a limited picture of the sanitation in the villages, it does provide evidence of the Government's goals in relation to public health. It also establishes that by and large villagers appear to have cooperated in these programmes, although sometimes reluctantly. The small and widely dispersed villages and the sometimes hostile physical environment undoubtedly contributed to problems of administration, support for village efforts, and supplies of necessary materials. Isolated villages were only rarely visited by medical professionals.

By the late 1920s, childhood mortality rates still remained very high, although they had substantially declined from the rates at the beginning of the century. The considerable effort put into the sanitary and public health programmes was therefore insufficient to achieve even moderate mortality levels. However, given the limited medical interventions available, these programmes undoubtedly made a significant contribution to the decline. Measuring this contribution depends on an assessment of the probable immediate causes of childhood mortality -- an assessment which must be made indirectly as there is no quantitative data on causes of death for any age group.

4. The Pathological and Disease Environment and Medical Response

4.1. The pathological and disease environment

Between the late 1890s and 1909, government reports from a number of departments, including Native Affairs, give qualitative accounts of the important epidemics. Reports after 1909 until the early 1930s list the infectious diseases which were considered the important causes of morbidity and mortality. In addition to these diseases, documented with their perceived prevalences at the beginning of each report, other diseases are noted in the provincial medical reports.¹⁴ Whooping cough (WC), for example, does not appear in the colony-wide list of communicable diseases in many years, but localised WC epidemics appear in provincial reports. A greater number of diseases, conditions and injuries appear in the returns for hospital admissions.

There was no systematic reporting of the immediate causes of morbidity and mortality by age.¹⁵ Determining the important causes of early childhood mortality therefore depends on a process of deduction from the available evidence from Fiji,

coupled with what is known about causes of childhood deaths from other developing and developed countries in periods of high mortality.

Given the intensive analysis of infant and child mortality found in the Decrease Report, and the named diseases in that report, the failure to document specific causes of death at early ages is difficult to explain. There are a number of possible reasons: 1.) The perspective on health which was adopted in the first three decades of the century was one of raising health standards for the Fijian population as a whole, in the hope of reducing the high levels of morbidity and mortality amongst children. This had been one of the important recommendations of the Decrease Report. 2.) Reporting causes of morbidity and mortality by age was much beyond the reporting systems which were in place for other than hospital deaths -- a small proportion of all deaths. 3.) The Decrease Report had documented some of the main causes of deaths to infants and children. These, especially diarrhoea, would have been well known to medical personnel, who may not have seen the need to report them.

4.2. Diseases in Fiji

The 1915 public health regulations listed the then notifiable diseases. These reflect the fears of the Government as well as the diseases known to be prevalent or recurring (e.g. measles) in Fiji. Provision for notification was carefully spelled out. (This is not reproduced here.) The relevant part of the regulations read:

"Infectious disease" means cholera, plague, yellow fever, small-pox, diphtheria, typhoid fever, croup, puerperal fever, dysentery, pulmonary tuberculosis, measles, mumps, whooping-cough, and any other disease which the Governor may see fit by proclamation to declare temporarily or permanently to be an infectious disease within the meaning of this part of this Regulation.

(Native Health Regulation 1915, CP15/15 in CO85/21)

In 1915, monitored "infectious" diseases, those regularly recorded in the general public health section of the medical reports, were: dysentery, tuberculosis, measles, dengue, influenza, tinea imbricata, yaws, filariasis, ankylostomiasis and leprosy. In 1925 the monitored diseases were the same, the few cases of diphtheria were noted and venereal diseases (of which only gonorrhoea was found amongst Fijians) were reported with yaws. The 1930 Medical Report added scabies and trachoma (although there was doubt that the diseases notified as such were

true trachoma.)

A much broader list of infectious and what were termed "local" diseases was given in the report on admissions to provincial hospitals. Table III-3 shows these for selected years, reporting only the largest categories. This table is not a table of prevalence but of those diseases for which Fijians sought treatment (in the later years provincial hospitals also treated some Fiji-Indians) and were cases serious enough to be admitted to hospital. Treatment for tuberculosis was often not sought until patients were in an extreme condition, for fear of being detained; the same was apparently the case for dysentery, although travel to hospital would have certainly been a complicating factor. The numbers for these diseases are likely to significantly underestimate their prevalence.

Yaws treatment was eagerly sought but admissions represented only serious secondary or tertiary cases. Numbers of disease-specific cases could vary dramatically by year as a result of epidemics. (See for example the number of dysentery cases in 1936.) Thus looking at the proportions of types of cases over time is not particularly meaningful, but they are useful in giving a picture of the mix of cases in a period. The "Other diseases" category varied in number as classification systems changed, and included "morbid conditions", such as cancer and operations. There is no explanation in these reports of "unclassified" cases, which increased over time. A number of hospitals were in the charge of NMPs, who would have been less experienced diagnosticians than the DMOs.

Notification of disease was the responsibility of those in the Fijian administration -- the **Bulis** and **Rokos** -- as well as the medical professionals. Few deaths occurred in hospital, although all should have been reported to the Fijian administrator. Thus which diseases were documented as important causes of death in a given year was subjective, depended on reports from those with and without medical training, and depended on this local information ultimately being included in the provincial and other reports

In the absences of cause of death data these reports on individual diseases -- notifications, admissions, etc. -- are useful in indicating the presence of a disease, and the relative numbers within a year, but are of no use in estimating rates of cause-specific morbidity or mortality.

Table III-3

Percentage Distribution of Diseases among Admissions to Provincial Hospitals, 1910-1936

	1910	1915	1921	1925	1930	1935	1936
<u>Infective Diseases¹</u>							
Dengue	4.4	0.6			6.7	0.1	
Dysentery	6.4	5.7	3.1	1.2	28.7	8.6	14.5
Enteric Fever	0.6	0.5	1.5	1.0	0.7	1.2	1.9
Yaws (Framboesia)	18.5	26.8	36.3	30.7	3.7	3.3	2.9
Influenza	2.2	1.3	1.6	7.8	3.7	5.1	5.3
Tuberculosis	2.7	2.9	1.8	2.0	1.7	2.7	1.9
Measles			5.1				3.1
Whooping Cough	0.3	0.5	0.3	0.3	0.1	0.4	0.1
Other Infective Diseases ²	3.0	5.3	2.0	5.0	4.1	6.5	9.7
<u>Local Diseases</u>							
(Diseases of the....)							
Eye	5.3	2.3	1.1	1.5	3.1	2.0	1.5
Respiratory System ³	13.7	5.8	4.9	6.9	6.7	9.8	9.4
Digestive System	9.9	4.6	2.5	3.1	5.0	5.4	6.7
Skin and Cellular Tissues	11.3	11.9	9.6	12.5	5.7	10.9	8.1
Other local diseases ⁴	6.9	5.6	5.7	10.0	7.5	12.2	5.2
Parasites	9.0	13.2	10.5	5.5	3.6	2.3	2.1
Injuries	3.5	4.4	6	5.0	9.9	11.5	8.8
Other Causes ⁵	1.3	3.6	3.8	1.8	1.1	5.1	4.3
Unclassified	4.9	5.2	4.1	5.6	7.9	12.7	13.8
N	5657	4857	3670	3566	5386	3388	4421

1. Reclassified as "General Diseases" after 1921, including anaemia, debility, diabetes and rheumatism.

2. Including gonorrhoea, leprosy, septicaemia and, after 1921, anaemia, debility, diabetes and rheumatism.

3. Including pneumonia.

4. Including the circulatory, lymphatic, nervous and urinary systems.

5. Including parturition and premature birth.

Of the highly pathogenic diseases which were undoubtedly most feared by the Colonial Government -- cholera, plague, yellow

fever, smallpox, diphtheria, and measles -- only measles and diphtheria were ever present in the Colony. Smallpox, which had reached Fiji in 1879 on a ship which was then quarantined was controlled by vaccination from the late 1880s. Diphtheria, which has been a leading cause of childhood morbidity and mortality in developed and in some other developing countries, was found in a few Suva schoolchildren in the mid-1920s, probably as a result of travelling outside Fiji. For reasons which are not fully understood, diphtheria is rare in some tropical environments; in some geographic areas this is the result of high natural immunity (Bwibo, 1978).

The disease environment in Fiji was to some degree determined by the fact that it was geographically isolated, with a small population living in dispersed villages. Some infections, such as measles, need a population of a minimum (but large) size to be maintained. This size is variously estimated for measles as 500,000 and 1,000,000. Thus measles was not maintained in Fiji, but was re-introduced periodically. Cholera, which was never seen in Fiji, does not travel well and spreads to areas in close proximity to the previous epidemic (Black, 1990). Where communal organisation is characterized by dispersed villages with different water supplies, water and food borne diseases may not lead to large scale epidemics as is the case in dense populations with a common source of water. This may explain why typhoid was a persistent problem in only a few geographic areas in Fiji, with localised epidemics. It may also explain the scale of epidemics in the 1930s when roads and methods of transportation were more fully developed.

Whooping cough was known in Fiji from the earliest government reports. Corney (reported in Bahr, 1912) wrote that "We know of a certainty that whooping cough is a disease of exotic origin in Polynesia, yet the Fijians have dubbed it with a purely native designation: *vu koli*, literally "dog cough." Numerous widespread epidemics were reported in the 1880s (memorandum by Thomson enclosed with dispatch of 12 April, 1892, in CO 83/55). Whooping cough "outbreaks" and localised epidemics, which surprisingly were not regularly monitored, appeared haphazardly in medical reports between 1910 and 1930, sometimes only as a note in relation to infant mortality (MD1924 and MD1925). Epidemics (or "outbreaks") were reported in 1910, 1911, and 1914. Between 1915 and 1923 there was little if any reported

whooping cough. Whooping cough was more prevalent in the period 1924-1929, with "many" reported deaths to children where it occurred. The fact that "children receive no protective antibodies against whooping cough from their mothers " means that it can occur even at very early ages, with typically serious consequences (Morley, 1978). Like measles, whooping cough in the young infant can be followed by weight loss or a failure to continue to gain. The child who recovers from the acute phase of whooping cough is particularly at risk of severe and often fatal bronchopneumonia (Morley, 1978).

The presence and contribution of measles to childhood morbidity and mortality is difficult to document in this period. Measles is today a major cause of mortality in many developing countries (Rodrigues, 1991). It had been the cause of massive mortality in the 1874 epidemic in Fiji. The Colony experienced another widespread measles epidemic in 1903. In this year the IMR was 506 in contrast to 245 in the previous year. The CDR of the Fijian population rose from 42 in 1902 to 63 in 1903. However, the next documented measles presence, between 1911 and 1914, was in the form of localised epidemics which did not apparently result in high levels of reported mortality. In 1912 it was said of measles that the natives "do not suffer as they did" (MD1912). Other localised epidemics were reported in 1921, described as of a "mild" type (MD1921). More widespread epidemics were reported in 1926-1928, also described as "mild".

Measles becomes a relatively mild disease of childhood, in the absence of malnutrition, where children are regularly exposed and there is therefore no large build-up of susceptibles. However, the evidence does not suggest that children throughout the Colony were regularly exposed. One explanation is that measles mortality is "lost" in the high mortality from other causes in children, while adults had acquired immunity in the 1903 epidemic. Another explanation is that diagnosis and notification was poor. Measles mortality can result from intercurrent infections and/or what is now known to be a depression of the immune system (Mims, 1987). Thus mortality which followed measles may not have been diagnosed as being associated with it. However, as the analysis in the next chapters will show, years with a substantial measles presence usually showed an increase in child mortality in relation to surrounding years, although not apparently in the years 1926-1928.

Enteric fever was endemic, and sometimes epidemic, but prevalent in only a few geographic areas. It is uncommon, in any event, in children under 2 and milder in children than adults (Watson, 1978). Its incidence was closely watched by the Government, especially in relation to Suva and nearby Rewa.

Dengue, chicken pox and mumps were reported over the period but were not reported causes of mortality.

Of the serious persistent diseases, yaws and tuberculosis were reported to be widely prevalent and were described as responsible for much morbidity and mortality in adults and children.

Dysentery was reported to cause heavy epidemic mortality in several years in this period, and is analysed below. Influenza was present in many years, in some years documented as "mild" and in others "severe". But it was acknowledged that many undiagnosed fevers were included in these notifications (MD1917). Exceptional mortality resulted from the influenza pandemic of 1918 (McDonald, 1959).

Leprosy had been monitored from the earliest days and a leper colony for Fiji and other Pacific islands was established at Makogai in 1911, but leprosy was virtually unknown to occur in children in Fiji.¹⁶

Of the serious parasitic diseases, ankylostomiasis (hookworm) and filariasis were present and monitored in this period; ascaris (roundworm) was discovered in Fiji in 1922 during the Ankylostomiasis Campaign. Filariasis is not a disease of childhood. Ankylostomiasis, originally thought to be confined to a relatively few of the wetter areas and common among Indians, was found in the 1917 prevalence surveys to be both widespread and common among Fijians. Ankylostomiasis and ascaris can be serious causes of morbidity in young children, and are discussed below.¹⁷

While this analysis helps map the disease environment, there are some notable omissions from the government records. Missing from the monitored diseases and conditions are those that cause or contribute to mortality in very early infancy e.g. prematurity, congenital anomalies, and diseases such as congenital syphilis and neonatal tetanus. Congenital syphilis was unknown among Fijians, probably because of the "protective" effect of yaws, but it was a cause of Indian infant deaths. While a very few cases of neonatal tetanus were reported amongst

Fijians in the 1950s, it was probably not a significant cause of death of Fijian infants in this period, although it was of Indian infants. Although later evidence suggests that prematurity was relatively uncommon amongst Fijians, the harder lives of many Fijian women in the late 19th and early 20th century, documented in the Decrease Report, may have made this a more important cause of infant deaths in the earlier years of this period than later. The sharp decline in neonatal deaths rates, analysed in Section 5, suggests this possibility.

Two of the leading causes of childhood mortality in periods of high mortality in both developed and developing countries today -- diarrhoea and respiratory diseases -- were not notifiable and only occasionally monitored. Pneumonia was more frequently documented in the Medical Department Reports of the 1920s.

4.3. Causes of childhood mortality

What then do these reports, read in the light of what are now known to have been the important diseases responsible for child mortality in developed countries in periods of high mortality and in developing countries today, suggest as the immediate causes of mortality in young children in Fiji between 1903 (the measles epidemic) and 1927 (the beginning of the Child Welfare Campaign)? We can make some assessment of these causes by a process of triangulation: 1.) Establish the major causes of childhood mortality in developed countries in periods of high mortality where death registration by cause is reasonably good. Causes of childhood mortality in 19th century England and Wales are described and analysed in McKeown (1976) and Mercer (1990); comparable data from the U.S. is found in Preston and Haines (1991). 2.) Establish these in developing countries where custom and environment are more similar to Fiji -- recent work on sub-Saharan Africa in Feachem and Jamison (1991) provides evidence from many sources. However, death registration by cause is poor or non-existent at a national level.¹⁸ Evidence is typically based on community surveys and health facility records. 3.) Identify the major causes of childhood mortality found in these sources among the known diseases in Fiji.

Despite differences in the social, economic and physical environment in developed and developing countries, these sources show that the great majority of children under 5 die from relatively few diseases and conditions (see also Preston, 1980).

These include diarrhoeal and acute respiratory diseases, the conditions and infections surrounding birth (including low birth weight or "prematurity"), tuberculosis, and the 'name' childhood diseases -- especially measles, whooping cough and diphtheria. Of these, both in the developed country series and in Africa today the majority of deaths come from just three categories: diarrhoeal and respiratory diseases and the conditions surrounding birth.¹⁹ In developing countries today an estimated half of deaths to children under 5 are from diarrhoeal and respiratory diseases (Kirkwood, 1991a and b).

Perhaps surprisingly the disease environment in Fiji, with some exceptions, more closely resembles that in the developed country series than in Africa. Neonatal tetanus, which is an important cause of infant death in some developing countries, was not found in large numbers in these developed countries nor in Fiji. Malaria, which contributes to a significant proportion of deaths in some tropical countries, was not found in Fiji. Malnutrition, which may have contributed to mortality in developed countries at the turn of the century, and is an important contributor in some parts of Africa, was unknown in Fiji. However, poor nutrition, in the form of an inappropriate diet, in the weaning period is likely to have contributed to weaning diarrhoea. Measles mortality in Fiji, while probably higher than reported, was not as high as in some parts of Africa today where it is a major cause of death of children between 1 and 4 (Aaby 1992; Omondi-Odhiambo, 1984; Rodrigues, 1991; Blacker, 1991). And measles was not permanently domiciled in Fiji.

From the above sources, and our knowledge of the known diseases in Fiji in this period, we can identify the probable causes of most Fijian childhood deaths. These are the respiratory diseases including pneumonia, influenza and bronchitis; the diarrhoeal diseases including dysentery; deaths in early infancy due to congenital anomalies, the birth process, and infections; and the childhood infectious diseases, especially whooping cough and measles.

To these we can add several others which will have contributed to childhood mortality. Yaws was believed by medical observers in Fiji throughout this period to be an important cause of death of infants (MD1909,1914), death resulting from intercurrent infections (Bruce-Chwatt, 1978).²⁰ Tuberculosis,

directly or indirectly, will have caused and contributed to a significant proportion of childhood deaths. Hookworm, in areas where it was prevalent and where worm burdens were high, would also have contributed to mortality from other causes.

However, to gain some idea of the relative importance (i.e. the proportional importance) of these different causes, we must turn to data from a developed country. What is needed is reasonably accurate data for a **period of high childhood mortality** in a country where the pattern of diseases was not too dissimilar to that of Fiji. Recent work of Preston and Haines (1991) offers one such source.

The 1900 U.S. Census Report (U.S. Bureau of the Census, 1902) included information on causes of death of children under 15 by age and sex, from a Death Registration Area covering 26% of the U.S. population.²¹ While the investigators acknowledge that the 26% may have been unrepresentative of the U.S. population as a whole, despite the large number of cases (N=102,225), that registration was incomplete and that diagnosis was "imperfect", they write "the data are instructive regarding the orders of magnitude of various diseases" (Relevant parts of these data are summarised in Table III-4).

There are, of course, differences between the pattern of diseases in the two countries. Yaws and the parasitic diseases were not found in the U.S. The name childhood diseases differ in the two series -- diphtheria and scarlet fever were not present in Fiji. However, tuberculosis was widely prevalent in both countries; Preston and Haines argue that it was probably a considerably more important cause of childhood mortality than these data suggest. (See also Ewbank and Gribble, 1993. This topic is discussed further in Chapter V.) They also observe that measles and whooping cough are probably underrepresented in these data. "Convulsions" was a common catch-all diagnosis for deaths in both the U.S. and the U.K at the turn of the century. Mercer (1990) has observed in relation to this diagnosis, "that many deaths classified under the term were probably of the kind observed in Third World countries today where improper food administered on weaning leads to gastro-intestinal disorders."

Table III-4
Leading Causes of Childhood Death by Age
(Percent)

AGE	United States 1899-1900		Kenya (Machakos) 1975-1978	
	<1	1-5	<1	1-5
Gastro-intestinal*	25.0	14.1	22.3	13.6
Convulsions	5.3	2.7		
Respiratory Diseases**	19.2	31.9	23.2	12.6
Prematurity	9.6		11.4	
Other diseases and conditions of very early infancy: congenital anomalies, debility, atrophy, malformations, asphyxia, neonatal infection	17.1	5.5	20.0	
Pertussis	2.2	3.4	1.7	2.9
Measles	1.1	5.0	7.2	32.1
Diphtheria	0.6	10.6		
Scarlet Fever	0.2	3.6		
Meningitis	3.7	6.9		
Tuberculosis	1.0	2.2		5.8
Malaria			1.7	9.7
Accidents	1.6	3.4	0.4	2.9
Malnutrition			1.7	16.5
Number of Cases	60524	29216	227	103

* Gastro-intestinal = "Selected gastro-intestinal diseases", including diarrhoea, dysentery, enteritis, and gastritis (U.S.); "Gastroenteritis" (Kenya)

**Respiratory diseases = "Selected respiratory diseases", including influenza, pneumonia, and bronchitis (U.S.); "Pneumonia" (Kenya)

Sources: U.S.: Based on data from the U.S. Census of Population: 1900, Vol. 4, part 2, presented in Preston and Haines (1991), whose series of selected leading causes does not sum to 100%. Those diseases and conditions shown here add only to 86.6% (<1) and 89.3% (1-5).

Kenya: Adapted from Omondi-Odhiambo (1984). Known causes shown here add to 89.6% (<1) and 96.1% (1-5).

Despite the very different social contexts, therefore, the similarity in the disease patterns suggests that the proportional contribution of the different causes of death to all childhood deaths in this developed country with high levels of childhood mortality probably approximates that of Fiji in the early part of this century. The Kenya data, as an example from a developing country, do not reflect the Fiji environment (Table III-4). Measles mortality is much too high in this African context and malnutrition is a more important factor than would have been the

case in Fiji. What these U.S. data show (and similarly for England and Wales in about the same period see Mercer, 1990, and Thompson, 1984) is the overwhelming importance of gastrointestinal and respiratory diseases as causes of death. The importance of deaths in early infancy is also highlighted by the U.S. series (and similarly for England and Wales see Mercer, 1990 and, for Bradford, see Thompson, 1984.) It is to these main groups of diseases that we should look to explain the mortality decline in Fiji in this period.

4.4. Disease-specific medical and public health intervention

Debate continues on the relative importance of different types of social intervention as they affected mortality declines in developed countries in the past and developing countries today (see e.g. Forum, 1991). McKeown's (1976) analysis of Britain's mortality decline is a frequent point of departure for this debate. Of special relevance to Fiji in these first decades, McKeown assumes that the medical contribution to the decline can be separated from the public health contribution. Szreter (1988) has challenged this,

The narrow definition of medical intervention, as either scientific discovery or the effects of clinical and hospital practices only, misleadingly understates the importance of medical men, and human agency in general, in bringing about the 19th century decline in mortality.

As Szreter shows, the "sanitarians" -- the advocates of changes in public health who were largely drawn from the medical community -- convinced government and the public of the need for environmental change, showed that these changes were feasible, and administered the necessary programmes. Medical and public health interventions cannot easily be separated in Fiji. Health policy from the turn of the century made the same departments of government and the same individuals responsible for both preventive and curative health care. Policies in relation to individual diseases included both types of initiatives. The treatment of yaws is a good example. Regulations from the previous century, re-written in the early part of this century, prohibited exposing children to yaws, as had been common. At the same time, regulations made it compulsory to bring children to hospital for treatment. Similarly, those responsible for advising on and inspecting sanitary conditions in the villages were those who were encouraging and giving hospital care for dysentery and encouraging cleanliness in children which would

diminish the chances of yaws contagion from open sores.

However, the number of effective medical treatments was extremely limited. Sulphur fumigation for tinea imbricata; iodide of potassium before 1910, and later arsenical drugs, for yaws; carbon tetrachloride for hookworm; vaccinations against smallpox and (in the early 1920s) against typhoid; simple treatments for fevers; for those in hospital intravenous drips and a change of diet for diarrhoea. But hospitals and the travelling medical practitioners could provide supportive care for many conditions, including treatment of fevers and encouragement of appropriate convalescence and the identification of high risk cases for some conditions. They also carried out surgery, cared for external infections and set broken bones. Care in pregnancy and childbirth was given, although the extent of this is poorly documented. Important amongst their socio-medical functions was undoubtedly discouraging fatalism.

The medical and public health interventions for several diseases are described briefly below. They illustrate the activist approach of the Medical Department in this period, the coupling of curative and preventive medicine, and the willingness of the Fijians to accept Western medical care where it provided clear results, but their resistance in other cases.

4.4.1. Dysentery

Dysentery was present in the first decade of the century and in epidemic form in 1900 (Vital Statistics Report: C083/72) and 1908 (Corney in Bahr, 1912), with high mortality. In 1910 the Medical Department Report labelled dysentery the "disease of the year." The disease spread after a serious hurricane and was reported to be an especially "virulent" type. In the same year, Dr. P. Bahr was sent out from the London School of Tropical Medicine to investigate dysentery in the Colony and advise. On the basis of his laboratory investigations, the first scientific report on dysentery in Fiji was written, which included a contribution from Corney on earlier epidemics. (MD 1910 and Bahr (later Manson-Bahr), 1912.) Bahr recorded that the "germ" was isolated in numbers of cases and "investigations made on its characteristics." While the disease was bacillary in origin in most cases (Shiga and Flexner bacilli were observed), amoebic dysentery was also observed in a small proportion of cases. The method of "conveyance and dissemination" was traced to houseflies, based on the admittedly circumstantial evidence that

dysentery occurred in the hot season, which is also the fly season, and that in the sugar producing areas there were no seasonal variations because of the constant presence of a large fly population. Acute and chronic effects were described. Cases of all degrees of severity were encountered. It was noted that an attack of bacillary dysentery was often the terminal affliction of other persistent diseases. The focus on houseflies as a method of "conveyance" would have given support to the sanitation programmes; the importance of personal hygiene would have underscored the need for abundant and clean water for washing.

Medical opinion from 1910 onwards expressed confidence that proper treatment would save most patients (Corney in Bahr, 1912; Bahr, 1912; MD1929). This treatment included a change of diet (largely milk in adults), liquids, intravenous salt treatments and medication -- a treatment unlikely to have been easily provided in the villages.

Table III-5
Dysentery Cases, 1911-21.

Year	Provincial Hospitals		Native Medical Practitioner Cases		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
1911	220	20	621	33	841	53
1912	177	16	581	21	758	37
1913	193	41	419	36	612	77
1914	221	41	569	72	790	113
1915	268	22	388	34	656	56
1916	89	13	308	19	397	32
1917	109	10	336	24	445	34
1918	90	11	430	34	520	45
1919	66	3	204	9	270	12
1920	43	7	73	2	116	9
1921	110	4	143	7	253	11

However, the unwillingness and/or inability to bring cases to hospital undoubtedly contributed to high levels of morbidity and mortality, as was argued at the time. Many government reports recorded the reluctance of Fijians to bring especially dysentery cases to hospital. Corney wrote as early as 1908 (Bahr, 1912)

that Fijians brought into hospital were less likely than Indians to survive because they were brought at too late a stage in the course of the disease. The 1911 Medical Report recorded that "Natives in the great majority of cases keep their dysentery patients at home if they can possibly avoid sending them to hospital." Cases were brought to hospital "only when [they] are in extremis and all native remedies exhausted." The hospital death rate from dysentery was acknowledged to be inaccurate as "the friends and relatives frequently insist on removing their sick from hospital if they consider the case is hopeless." As Table III-5 shows, the number of NMP cases was very significantly greater than those admitted to hospital, despite the fact that methods of treatment in villages would have been limited.

Some evidence suggests that instruction on the care of the sick was in many cases not followed, especially in relation to diet and convalescence. Dietary restrictions, in particular, did not conform to Fijian beliefs about the appropriate treatment of serious illness, which prescribed food in the case of fever and other illness. As written in a later journal article by one of the NMPs, "Their own idea is that a sick person must eat more food in order to get better (NMP, 1939, Vol.3 which includes a discussion treatment of dysentery cases)."

By 1916 the Medical Department reports that there were no epidemics and the type of cases seen was less severe. The 1922 report showed few deaths reported by the NMPs, and dysentery was no longer considered a "principal cause of death." Reports from the provinces between 1922 and 1927 suggested that dysentery was a "rare occurrence" and "virtually eliminated". Credit for this was given to the better sanitary conditions.

In 1929, however, a serious epidemic of "Shiga" dysentery of the "virulent form" occurred, which greatly surprised the medical establishment. The Medical Report for this year noted the heavy toll in deaths to children under 5. As compared to previous epidemics there was a rapid medical response, including the setting up of temporary hospitals, forcing cases into hospital, and quarantines. Investigation of the spread of the epidemic led finally to the recognition of the importance of "personal contact with cases and carriers" as the primary method of dissemination. Childhood mortality in this and the following year was high (Figure III-7 below), particularly high in 1930. Shiga dysentery was prevalent in different areas throughout the

1930s.

The failure of the many public health measures to limit the effects of dysentery was, in part, a function of the greater pathogenesis of some of these micro-organisms as compared, for example, to bacteria which lead to enteric fever or cholera. For **Shigella dysentery** a disease-producing dose is only 10 bacteria in contrast to **Vibrio cholerae** with a dose of 10^8 bacteria (Mims, 1987). Against the highly pathogenic forms of dysentery neither public measures nor treatment were sufficient to prevent large numbers of childhood deaths. (This is discussed in the next chapter in relation to the Child Welfare Campaign.)

4.4.2. Yaws

The contribution of yaws to the mortality of children under five years in Fiji is both difficult to assess and perhaps its epidemiological significance will never be fully assessed. Yaws control campaigns began in the 1950s in many countries before research programmes on the age-specific prevalence of yaws, the effects of yaws on the immune system, the evidence of yaws and intercurrent infections. Illustrating the paucity of research on yaws, the then Director of the Wellcome Museum of Medical Science, London wrote in 1953,

During the past ten years probably only about 25 papers have been published on yaws in Africa; many of these deal with one or two cases or with treatment of a few patients and their clinical observation for a few weeks only ...

Little work has been done in yaws comparable in thoroughness to the recent studies of the epidemiology, treatment and prevention of malaria or of African trypanosomiasis... There is urgent need for applying to the investigation of yaws the scientific method, by men trained in it and free of therapeutic responsibilities... if by some optimistic chance, control with modern drugs proves much easier than control with the drugs of the past and rapid eradication results, then much useful knowledge, which might have been of value in the control of other diseases, may well be lost for ever (Hackett, 1953)

By the mid-1950s effective control programmes using penicillin were under way in many countries.

From the time of the Decrease Report yaws contagion was believed to be universal. A 1916 Fiji Medical Report asserted that

Practically every Fijian suffers from typical primary and secondary yaws. The disease begins almost always after the sixth month and usually between the second and sixth years... (CP54/17; CO85/23).

The 1910 Medical Department Report recorded:

Framboesia in young children, especially in the more distant and less frequented parts of the Colony, continues to be responsible for much sickness amongst children and consequent mortality. As natives slowly become more enlightened, they bring their children with more confidence for treatment; but the process of their education is discouragingly slow...

The treatment of yaws was one of the most successful medical initiatives in the Colony's history. In 1910, a year after the discovery of their important effects on yaws, arsenic derivative (Salvarsan or Neo-Salvarsan) injections were given to yaws patients at the Colonial Hospital (Perine et al., 1984). This treatment remained the drug of choice until antibiotic treatment became available on a mass scale in the 1950s. In 1911 Salvarsan was beginning to be used in the provincial hospitals. It was a highly effective treatment. "Salvarsan continues to give admirable results...and the number of recorded relapses after its use is small (MD1914)." Although some DMOs argued that patients were slow to seek treatment, the provincial hospital returns suggest otherwise. As Table III-3 shows, yaws patients were the largest percentage of hospital patients until the 1930s. Between 1911 and 1920 nearly 12,000 cases of yaws were treated in hospitals, most with Salvarsan. Admissions were largely tertiary cases and were probably mostly older children and adults (MD1915), although one report suggested that of the provincial cases seeking treatment in late stages about 10% were children under 5. Treatment by injection was "very popular" and, as one provincial MO reported (MD1915), was "largely responsible for the success of the hospital this year."

The NMPs continued to treat large numbers of yaws cases (between 1500 and 2000 in a year) in the villages (MD1915,1919); probably until the mid-1920s these were treated with the less effective iodide of potassium. Thus large numbers of cases of primary yaws would still have been found in villages, especially remote villages. The supply of Salvarsan slowed during the war years and was in short supply in other years, in part because of insufficient funds (MD1915,1921).

Although it was no longer universal (or legal), purposive infection was thought to exist (MD1916; MD1917). However, in most cases infection of infants was probably accidental and a result of poor understanding of the means of transmission. The 1922 Medical Report noted that "the native mother is no longer eager

for her child to have yaws." In 1924 it was reported that the "amount of secondary yaws is certainly diminishing in the Fijian villages" and the worst manifestations of tertiary yaws were rarely seen. By 1925 treatment by injection was carried out in all cases of secondary yaws seen in the villages. This was an important change which would especially affect villages in remote areas, those least accessible to hospitals. In 1928, supported by the Rockefeller Foundation, an eradication campaign was undertaken with the objective of treating all children and all manifest cases (MD1922, MD1924, MD1925, MD1928). Table III-3 shows the decline in the percentage of secondary and tertiary yaws cases to single digits by 1930. The number of cases of primary yaws will have declined in this period as sources of exposure declined, but no estimate was made of these numbers.

However, throughout most of this period yaws would have been a significant disease of childhood and, with intercurrent infections, a cause of mortality. Differential risk of exposure by geographic area is noted in the Medical Report for 1927:

A good deal of secondary yaws still exists in many districts among the Fijians but it has almost disappeared in those places where the local native administration has been keen. Severe tertiary yaws is rare now that practically all Fijians know the certainty of quick cure...

Similarly, the 1928 Report showed no yaws on the well-managed island of Koro but the need for treatment of numerous cases of secondary yaws in Rewa.

The use of the arsenic derivatives was effective if a full course of treatment was given and if cases were followed overtime. But for many cases this level of treatment was unlikely (Hill, 1953). In relatively carefully controlled studies of yaws in Jamaica based on data from the 1930s, Hill (1953) concludes,

There appears to be a constant level below which we cannot go with the ordinary treatment methods...it is seen that relapses after arsenic or bismuth treatment are about 14-15% one year after treatment and 25% 2 years after.

Latent cases remained a source of re-infection in the community over many years. Before the use of penicillin, these cases remained even after active eradication campaigns. Penicillin was not used in a yaws campaign in Fiji until the 1950s (see Chapter V).

4.4.3. Hookworm

In areas where there were high infection rates, ankylostomiasis (the intestinal helminth, hookworm) would have contributed to the high rates of morbidity and mortality amongst children. Jelliffe and Jelliffe (1978) write, "Young children are especially likely to be seriously affected, even by relatively light worm burdens, because they have small blood volume, high needs for both iron and protein, and a diet likely to be deficient in both." The diet of the older Fijian infant, especially the weaning diet, would have been low in both, certainly in protein.

Hookworm was known to be a source of morbidity in the Indian population from the early 1900s. Although hookworm was reported to have been "fairly prevalent among Fijians" in the 1909 MDR, it was believed to have less "grave manifestations" than those found in Indian labourers. It was not until the first prevalence survey was carried out in 1917 that the degree of infection amongst Fijians in close contact with Indians was established. The survey showed that 79% of Fijians and 90% of Indians in the Navua area (a high rainfall area near Suva with a large Fiji-Indian population) were infected. Of the Fijians under 5 who were tested, 63% were infected. A larger survey of 9 provinces carried out in 1922-1923, and including both wet and dry areas, showed a substantial difference in the proportions infected in these different areas. In the Nadi and Lautoka areas on the dry side of Viti Levu about 40% of those tested were infected and in the high rainfall areas such as Rewa and Navua about 65% (Fijian and Fiji-Indians). The age of cases was not reported by ethnic group, but in the wet areas over 50% of children 5 years and under were infected. The worm burden was not reported but those living in wet areas were described as "heavily infected" (MD1922).

A large proportion of Fiji-Indians (35%) were also found to be infected with *ascaris* (roundworm) in wet areas, while this was the case for only 4% of Fijians.²²

Between 1922 and 1924 all of Fiji with the exception of a few isolated areas was treated for hookworm using Carbon Tetrachloride; treatment before this had been with Thymol (report by Dr. S.M. Lambert in MD1923). However, re-examination showed that re-infection was taking place at a relatively rapid rate, probably the result of poor sanitation. At one month after

treatment 89% of those infected were free of infection; 21 months later this was reduced to 57% (MD1923). Treatment programmes at a substantial level continued in the following years. The hookworm campaign also included a latrine building programme, largely amongst the Fiji-Indian community, and a massive health education programme.

4.5. Conclusion

There were no effective, easily administered, medical treatments for the probable leading causes of childhood mortality in this period, the diarrhoeal and respiratory diseases. These treatments would come some decades later -- including sulfonamides and antibiotics and oral rehydration therapy in the late 1970s. However, the Government had shown an extremely proactive approach to health care and sanitation whenever new medical or sanitary technology became available. The Fijian population had shown a willingness to try new chemotherapeutic treatments where they provided positive and speedy results. But for most childhood diseases these did not yet exist.

Against the airborne diseases -- respiratory infections, measles, whooping cough and tuberculosis -- public health and medical programmes can have had only modest, if any, effects through treatment and probably little through prevention. The numbers of cases of tuberculosis were closely monitored and large numbers of patients came to hospital but the potential for treatment was limited (MD1916). Efforts at prevention were made. In 1909, for example, a "simple circular was drawn up in Fijian showing the main causes of the spread of the disease, in the simplest language. This was very widely circulated through stipendiary magistrates, district medical officers, and all native officials to native villages (MD1909)". Attempts were made to increase ventilation in houses but houses remained largely single-roomed with children and adults living closely together. The movement of the kitchen to a separate area (which came to be known as the *vale ni kuro* or house of pots) was enforced during this period and spitting within the house and on mats was a continuous concern of the medical professionals, as medical reports document. But these changes, along with the isolation of the sick, are likely to have had little effect on exposure to airborne diseases. (The difficulty of influencing exposure to these diseases is well described in Chapter 6 of McKeown, 1976.)

The sanitary programmes, on the other hand, are likely to

have significantly affected exposure to pathogens by improved water supplies, excreta disposal and village cleanliness. The sanitary practices of individuals and communities had changed, despite some resistance. The integrity of water supplies was maintained, water supplies were renewed, and latrines were used, at least by adults (e.g. see MD1928, Lau). Thus it is likely that against diarrhoeal diseases the medical and public health programmes would have made some considerable gains.

5. An Evaluation of the Medical and Public Health Initiatives: 1897-1927

All of the component rates of childhood mortality declined between the end of the century and the beginning of the Child Welfare Campaign in 1927, although with the exception of stillbirths the trends show considerable volatility, largely in response to epidemic diseases.

Figure III-3

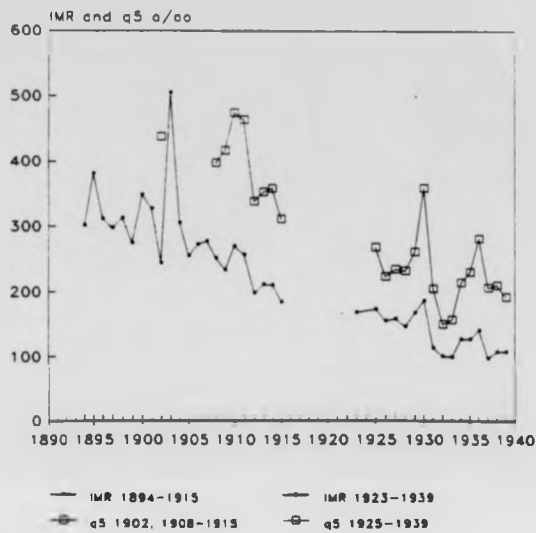
Fijian Childhood Mortality Rates
1894-1939

Figure III-4

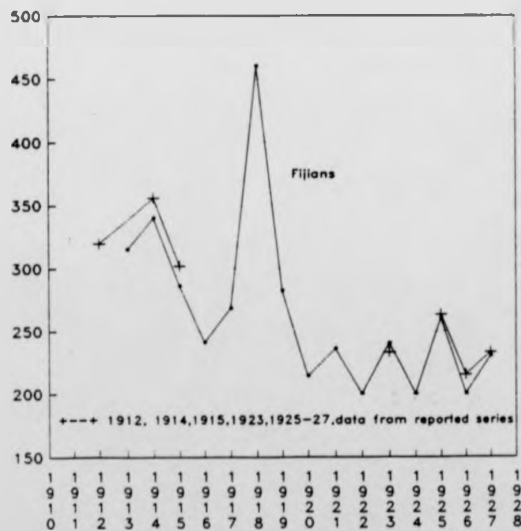
Deaths <5 Years/1000 Births
adapted from Lambert, 1938

Figure III-3 gives a general picture showing, despite volatility, the overall decline in the IMR and in 5q0. Close analysis of the trends is hampered by the considerable amount of missing data and the data demands of the calculation of 4q1. As described in Chapter II, the method used here for this calculation requires data from 6 consecutive years. In the early years of the century this is only possible for 1902 and 1908-1915. As noted in Chapter II, there are no reports on the vital statistics of the Fijian population for the years 1915-1922 and 1924. A graph published by S.M. Lambert in 1938, using the unusual measure "deaths under 5 years per 1000 births in the year" gives us some idea of mortality in these years. This graph suggests that although there was volatility in the numbers of deaths, the mortality decline which begins in about 1912 continued after 1915.²³ Mortality, as measured here, is lower in all of the years between 1916 and 1925 than it is between 1912-1915, with the exception of 1918 (the year of the influenza pandemic). Births decline by about 9% between 1912-1915 and 1925-1927, probably as a result of the disproportionate deaths to young adults in the 1918 epidemic. If "numbers of deaths under 5", the Lambert measure, stayed the same as the average of those in 1912-1915 we would not see a decline in this measure but an increase. The numbers of deaths, in fact, declined by 35% in the two periods (using 1914-1915 for the first period, as 1913 is a missing year for deaths between 1 and 5).

Keeping these limitations in mind there are a number of ways to measure the mortality decline. The simplest measures the average of rates in the comparison periods. This is the measure used in Table III-6, which shows the proportional decline in the different component rates.²⁴ However, the magnitude of the decline will be affected by the years chosen for comparison, especially in a period where rates are highly volatile. For the early years of the comparison periods shown in Table III-6 evidence of the prevalence of specific diseases is poor, and there may have been epidemics in these years which were unreported. The periods 1914-1915 and 1928-29 are chosen to avoid the epidemic years.

Table III-6

Proportional Decline in Component Mortality Rates, 1900-1928.
(Percent)

Years	SBR	NNMR	PNNMR	4q1
1900-1901/1914-1915	49	32	45	31*
1914-1915/1927-1928	--	18	24	45
1900-1901/1927-1928	--	45	59	62*

* Based on 4q1 for 1902 only.

Another approach is to try to measure "endemic" mortality, i.e. mortality that is not the result of an epidemic or social crisis. Table III-7 shows mortality levels for the years 1894-1930 averaged over two or three year periods so as to exclude reported epidemics. Grouped in this way both infant and child mortality show sharp declines over the period.

However, identifying the epidemic years is by no means straightforward. As explained in Chapter II, no attempt has been made to develop special measures of "crisis" mortality for this analysis. Spikes in Fijian childhood mortality, based on all the available evidence, were fairly clearly the result of epidemics, sometimes exacerbated by natural disasters such as hurricanes. After 1908, when we have full medical reports that continue to the present, almost every significant spike in childhood mortality is found in a year with a widespread epidemic usually of whooping cough, measles, dysentery or some combination of these. However, localised epidemics of these and other diseases kept endemic mortality high and the prevalence of particular diseases in a year is sometimes difficult to assess. Thus the assessment that a year is an "epidemic year" is subjective and to some degree circular. The high rate suggests that there is an epidemic; the search for evidence of the epidemic appears to explain the high rate. The evidence of disease patterns for some years at the end of the century and in the first decade is limited. There were few medical officers and they and the few NMPs covered very large geographic areas, so the system of disease notification would have been a relatively poor one.

Table III-7
Period Estimates of Infant and Child Mortality

	IMR		4q1	
Year		Average		Average
1894	302	332 (1894-1896)		
1895	381			
1896	312			
1897	298	295 (1897-1899)		
1898	313			
1899	274			
1900	349	307 (1900-1902)		
1901	328			
1902	245		255	
1903	506			
1904	306	278 (1904-1906)		
1905	256			
1906	273			
1907	278	255 (1907-1909)		
1908	252		185	213 (1908-1909)
1909	234		240	
1910	270		279	
1911	257		277	
1912	198	205 (1912-1913)	177	180 (1912-1913)
1913	211		183	
1914	210	197 (1914-1915)	190	175 (1912-1915)
1915	184		160	
1925	173		115	
1926	155		80	
1927	158	152 (1927-1928)	91	96 (1927-1928)
1928	147		102	
1929	167		113	
1930	186		210	

Despite these limitations in the quality of the evidence, Table III-7 does show a substantial decline in what is probably endemic mortality.

A third approach to the measurement of declining mortality involves an assessment of the frequency of years of unusually high rates and the amplitude of rates in epidemic years. As mortality trends in developed countries show, in the period of rapid decline to relatively low mortality levels the sharp peaks in mortality occur less frequently and the amplitude decreases (e.g. see Woods, 1988). This can be the result of a number of factors, including a decline in endemic mortality, changes in the disease patterns, and greater resistance to disease in the population. One disease-specific example for this period in Fiji can be drawn from the mortality levels in dysentery-epidemic years. Dysentery was reported to be widely prevalent at the end of the century in Fiji and was believed to be responsible for many deaths; again in 1910 Shiga dysentery was prevalent, reportedly causing many deaths; and this disease emerged in a very pathogenic form in 1929-1930. However even in 1930, a year of unusually high mortality for the period, the rates of infant and child mortality were considerably lower than in the previous dysentery-epidemic years. But the volatility in the rates of infant and child mortality in this period and in the 1930s shows that the smoothing out of rates which occurred in the later stages of a mortality decline had yet to occur, even though the trend was a declining one. Looking ahead to the 1930s (Figures III-6 and III-7 below) it is clear that levels of both post-neonatal mortality and child mortality (4q1) continued to fluctuate. Against the highly pathogenic epidemic diseases -- whooping cough, dysentery, and probably measles -- there was little effective medical or social response.

Turning now to the specific component rates: stillbirth rates showed a remarkable and consistent decline from a rate of 80 in 1900 to 39 in 1915, the last year for which these rates were reported (Figure III-5). Neonatal mortality also declined very substantially in the same period, but with rates that reflect a volatility that suggests that a substantial proportion of deaths were due to exogenous causes (Figure III-5).²⁵

Figure III-5

Sillbirth and Neonatal Mortality Rates
NND:1894-1938 SB:1894-1915

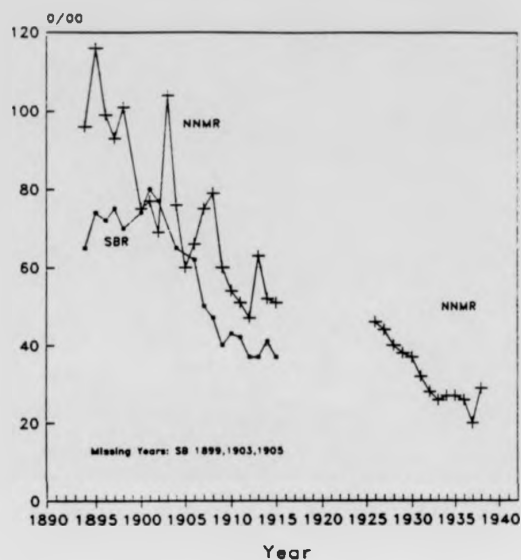
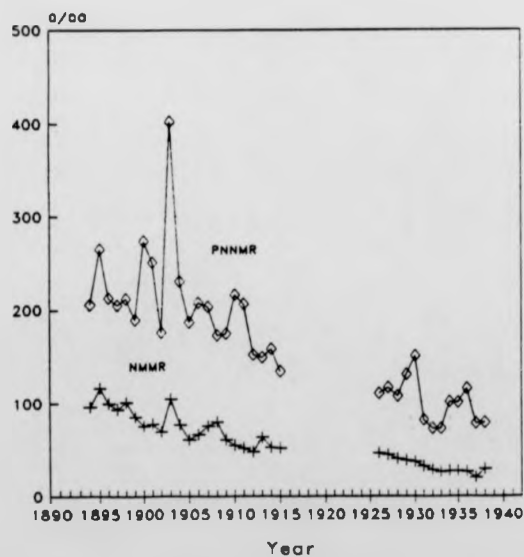


Figure III-6

Neonatal and Post-Neonatal
Mortality Rates



The NND rates continued to decline, but at a slower rate, between 1915 and 1929. There is undoubtedly some transfer of neonatal deaths to stillbirths where deaths occurred very shortly after birth. This is thought to occur in many cultures, sparing parents the often costly and sometimes elaborate ceremonies which can attend the death of a child. Stillbirth rates of 70-80 at the beginning of the century in Fiji would be considered very high even for high mortality countries today; perinatal mortality (which also includes deaths in the first week of life) is estimated at between 40 to 60 in such countries. Exceptionally, rates are recorded of 80 to 100 "in the least developed and most disadvantaged countries (Walsh, 1990)". The proportion of neonatal deaths to all infant deaths varies widely across cultures and is particularly high where low birth weight babies and/or prematurity are common and where women are severely undernourished -- problems not documented for Fijian women. Between 1900 and 1915 the proportion of neonatal deaths/total infant deaths was quite low, at 25%. Some of the best data on the age pattern of childhood deaths in high mortality settings is only available for much later periods following the cross-national surveys of the 1970s-1990s. The high mortality countries in the World Fertility Survey (WFS) had recorded NNMRs nearly as high or higher than the post-NNMRs in 6 of 7 cases (Rutstein, 1983).²⁶ It is argued in succeeding chapters that NNMRs, even allowing for some underrecording, were probably low for Fijian women in reasonably good health. However the very low rates in this period suggest that some (unmeasurable) proportion of neonatal deaths were reported as stillbirths.

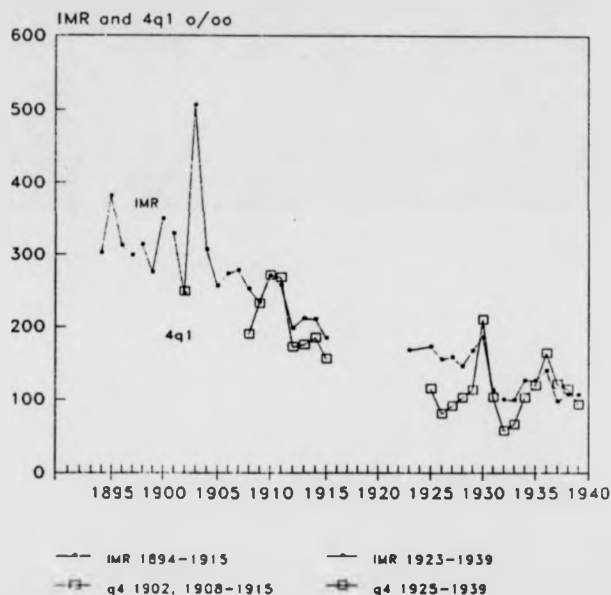
The rapid decline in stillbirth and neonatal deaths suggests that a positive change in the health and conditions of women was taking place during this period. This had been a goal of the authors of the Decrease Report and a number of regulations were passed to protect women during pregnancy and while breastfeeding. One measure of the overall health of the women of the Colony is the Crude Death Rate, which declined between 1900-1902 and 1926-1927 by 48%, from 44.1 to 23.0.²⁷ The proportion of all deaths which occurred to children under 5 changed only modestly in this period.²⁸ In 1900-1902 40% of all deaths occurred to children under 5, and 25% to children under 1; these percentages were 34% and 23% respectively in 1926-27.²⁹ Thus, mortality to older children and adults was also declining at a

rapid rate.

Although post-neonatal mortality declined in the period, the relatively low rates in non-epidemic years which were sustained into the 1920s only began after 1912; before that the rates were both high and volatile (Figure III-6).

Figure III-7

Infant and Child Mortality
1894-1939



What appears to be a dramatic decline in 4q1 in 1912 (Figure III-7) is, in part, the result of having an incomplete series for the early high mortality years. However, the epidemics in 1910-1911 undoubtedly were responsible for many child deaths -- dysentery in 1910 and measles and dysentery in 1911. The epidemics in these years probably also explain the high PNNMRs and the drop in and after 1912. Yaws treatment began in earnest in 1911-1912 and probably contributed to the decline in mortality in the years 1912-1915. The proportional decline in 4q1 in the short period between 1914-1915 and 1927-1928 is

substantial. Child mortality reached new lows over this period in non-epidemic years, with 4q1 approaching 100 by the late 1920s.

Let us consider the effects on mortality which might explain the differential declines in component rates. These include: possible changes in the diseases themselves, particularly in their pathogenicity; changes in the social context, especially the standard of living -- changes which would increase resistance to disease; better medical provision and care; and the public health initiatives. In relation to the first factor, although particularly pathogenic forms of dysentery were reported to have been prevalent in the first decade of the century, and especially in 1910, after about 1915 the effects of these appear to have lessened until the dysentery epidemic of 1929-1930. The apparent changing pathogenicity of this disease (or diseases as dysentery is not "monotypic" (Mims, 1987) may have had some effect on mortality rates, independent of medical and public health measures. In particular, this may have contributed to the decline in PNNM and in child deaths. Both sets of rates show sharp increases in 1910-1911 followed by a substantial drop in the following year, suggesting vulnerability to dysentery in these age groups. The declining prevalence and pathogenicity of dysentery is documented in the medical reports in the years following. Immunity from measles for a large part of the population as the result of the 1903 epidemic and its more frequent presence in the Colony may have made measles less pathogenic. But in many years there was no measles presence. Thus changes in either exposure or resistance will have played little part in explaining mortality in most years. The only documented seriously pathogenic introduced disease in this period, apart from the probable new strain of dysentery introduced in 1910, was the strain of influenza introduced in 1918. With these exceptions the diseases present, as they can be documented from medical and other reports, remained the same over the period. However, the level of exposure, especially to water and food borne pathogens, undoubtedly changed.

Changes in "standards of living", including nutrition, can be largely discounted. The work of the NOBNs and NMPs may have had some positive effect on infant feeding practices, but evidence from later periods does not suggest a significant change. There was no significant urbanisation, which might have

increased access to medical care; the Fijian population remained throughout this and later periods village-based. There is no evidence of significant changes in the demographic context, e.g. age of marriage or fertility patterns.

Limited economic development was taking place but largely within a communal context. Only a small proportion of men worked away from their villages; in 1926 this number was estimated as "8.7% of the taxable age group" (Lal, 1992).³⁰ Trading relations were becoming established which brought in increased personal and communal income (See e.g. Knapman, 1976). Land was being leased to "free" Indians (Gillion, 1962), largely increasing communal income. Although sources of income may have increased, there were considerable communal obligations to the church, to the chiefs and to the Government in the form of taxes (Lal, 1992). In addition money for water supplies was being communally raised, while provision of new housing was becoming an individual obligation (Knapman, 1976). And by the beginning of the century personal income was needed for "biscuits, tinned meat, flour, sugar, soap, salt, kerosene, matches, tobacco and cloth [which] were all freely used (Knapman, 1976)." However, there is no evidence that these changes in the socio-economic context and in living standards were of sufficient importance to affect disease resistance.

Education, as measured by literacy, was high throughout this period (Table III-2 and Appendix C). The Medical Department assumed high levels of literacy in its distribution of circulars in relation to health problems (e.g. see MD1910).³¹ Hygiene was included in the school curriculum (CP47/38). Health education was included in some sanitation programmes and in the work of the NMPs and NOBNs. The relatively high levels of education may have contributed to the mortality decline through an increased ability to weigh the merits of the different medical and public health programmes and perhaps in mitigating the influence of traditional healers, although these were also used. However, education levels varied by province. The evidence, although limited, shows that even high provincial levels of literacy were insufficient to be translated into low levels of mortality, although Kadavu, Rewa and Lau -- with high levels of literacy -- maintained **relatively** low levels of infant mortality.

Therefore it is to the public health initiatives and to a lesser extent medical provision that we must turn to identify a

significant impact on declining mortality. We have established in relation to disease patterns that the public health initiatives were more likely to affect **exposure** to water- and food-borne diseases than to airborne diseases. Medical treatment, with the exception of yaws treatment and maternal and infant care, probably also had its greatest effects on these diseases. The effect of yaws treatment on the mortality decline is unquantifiable, but yaws was thought to make an important contribution to morbidity and mortality by medical professionals at the time (e.g. MD1909). By 1912 Salvarsan, the treatment of choice, was widely used and brought large numbers of Fijians to hospital for treatment. Directly, or indirectly through the increased contact of those who were ill with medical professionals, yaws treatment is likely to have played a part in the sharp decline in mortality in and after 1912. Medical treatment for other diseases was limited but there was substantial provision of medical care, which was taken up by the Fijians. For example, the treatment of *tinea imbricata* (on which considerable effort by the NMPs was expended) and other skin diseases may have limited the transmission of yaws. The effects of these treatments on the mortality decline awaits further research, e.g. on types of treatment for dysentery and on the frequency of children's admission to hospital.

Perhaps most unexpected is the decline in SBs and NNDs, reflecting women's better health and/or better care before and after childbirth. Evidence of these social changes is very limited but the decline in the rates themselves suggest that this aspect of health care was probably of greater importance than the reports of the day suggest.

An "argument by exclusion", as this is, leaves much room for future debate, but this analysis has been able to establish some of the parameters of that debate. No attempt has been made to quantify the amount of change due to government initiatives. But the argument rests that the government initiatives related to public health and medical provision are responsible for the major part of the decline in childhood mortality in this period.

1. While 1927 marks the beginning of a new campaign to improve child health, the subject of the next chapter, data and evidence from the late 1920s and early 1930s are shown here where relevant.

2. See Macnaught (1982) for a history of these years.

3. The Medical Department ran hospitals in Ba, Taveuni and Rotuma, and inspected plantation hospitals for indentured Indians (Blue Book 1902).

4. Im Thurn was notably sceptical about the level of resources spent on health initiatives. In 1905, he wrote to London: "Personally, I am as yet by no means satisfied that the benefit secured by the institution of provincial hospitals for the exclusive use of the natives is always commensurate with the cost...(CO83/80)" and in 1908 (CO85/14) "I read with some apprehension of the clamour for doctors and hospitals in new places."

5. The 1910 visit to Fiji by Manson-Bahr to investigate the causes of dysentery following the epidemic in that year is suggestive of the rapid communication between the colony and the medical community in Britain (see Section 4.5). Yaws treatment provides another example: Salvarsan discovered as a treatment for syphilis in 1910 was first used in Fiji in 1911.

6. The fear of measles, when it became clear that an epidemic was likely, provoked a different kind of response altogether from the people of Rewa. In response to a government circular on how to cope with an epidemic and on the care of those who became ill, the people were ordered by their chiefs to stay indoors and make as much noise as possible to scare away the "evil spirits". (This anecdote is from the Hoodless biography by Guthrie, 1979)

7. An analysis of Fijian beliefs about the causes of disease and illness is outside the scope of this work. One useful summary of these beliefs comes from one of the early NMP articles to have been written in their journal and summarised by Guthrie (1979) "Fijian beliefs about the causes of illness were twofold. Firstly, diseases were caused by evil spirits entering a person. Secondly, as a result of wrong doing by a person evil demons.. would inflict illness to punish them. These misdeeds may have been done by the person's ancestors." However, as against this many diseases were seen as natural enough to be remedied by native medicines, e.g. boils (See Thomson, 1908). And as the next section shows, Fijians were pragmatic in accepting Western medical care when they observed it to be working, as, for example, in the treatment of yaws.

8. For purposes of presentation three provinces are excluded from Figure III-1. Two of these, Serua and Namosi, were very small. The IMR in Colo North, the third, declined from 371 in 1898-1901

to 266 in 1914-1915. Figure III-1 is a "high-low-close" chart. The "close" is the average of the years 1909-1911. Its distance from the 1914-1915 average shows that the provincial trends are by no means linear nor is the rate the same across provinces.

For Lau the direction is reversed.

9. Native Regulation 1 of 1891 required all Fijian children between the ages of 6 and 14 to attend school. According to the Education Commission which reported in 1909 (CP30/10), this was not enforced, but nevertheless it had "little doubt that children are in regular attendance at schools in native towns and villages." There was no accurate information on the number of children of school age; the only estimates are the numbers attending which may include "youths" and perhaps "adults". These numbers were occasionally published, estimates are as follows: 1900 27,435; 1907 18,734; 1909 19,445. The Fijian population in the 1911 census was 81,675, of which 27,340 were "children", i.e. those who had not reached puberty. See also Appendix C.

10. The four data points are averages of 1.)1898,1900-01; 2.)1906-1908; 3.)1909-1911; 4.)1914-1915. Missing years are 1899, 1903, 1905, 1913. 1903 is the year of the measles epidemic; the colony-wide IMR is shown.

11. There is not a report for every year for every province. This may be the result of a DMO's absence from office or the failure of the report to be received in time for inclusion in the annual report. Some years are more complete than others, which may reflect the CMO's priorities.

12. Between 1911 and 1936 (census years) increasing numbers of villagers left their villages to work on plantations or to move to more urban areas. In the country as a whole, the proportion living outside their villages increased from about 6% to 17%.

13. The rather self-satisfied tone of this speech may have been connected with the fact that he was petitioning for promotion at the time but this is probably a fair description of the aspirations of the Government.

14. "Prevalence" and "epidemic" are used as in everyday language in these reports.

15. Although we are here analyzing the probable "immediate" causes of death, that is the disease(s) to which a death is attributed, it is still within the context of the explanatory models described in Chapter 1. "Cause" in this context is taken to mean the "immediate or direct cause" recognizing that there can be synergistic effects of immediate causes, e.g. measles and tuberculosis, as well as the effects of proximate determinants on immediate causes e.g. malnutrition and measles. As Mosley and Chen (1984) note, "... a child's death is the ultimate consequence of a cumulative series of biological insults rather than the outcome of a single biological event." And these biological insults can result from social factors such as maternal behaviour.

16. A colony on Beqa had been established in 1900 but was believed to be too close to Viti Levu.

17. Considerable effort on the part of the NMPs went into the treatment of *Tinea Imbricata* (Tokelau Ringworm) by sulphur fumigation using boxes which were sometimes carried around the countryside.

18. Of course, custom and environment vary widely throughout Africa; see Blacker (1991) for a recent discussion. However, in much of rural Africa levels of sanitation, water supplies and child care patterns will more closely approximate those of Fiji than the U.K. and U.S. at the turn of the century.

19. Fiji is a non-malarial country. Malaria is an important contributor to childhood mortality in malarial countries (Bradley, 1991).

20. The author of the 1914 Medical Department Report writes, "It accounts for a large infantile death-rate, either directly or when complicated by dysentery or broncho-pneumonia." This accorded with Fijian perceptions and their attempts to prevent infants being purposely inoculated until their second year.

21. The 1900 census included questions from which childhood mortality estimates can be calculated based on surviving children. The overall estimate for q5 was 192, for urban areas 215 and for rural areas 176. This is considerably lower than the q5 of 311 in Fiji in 1915. On the other hand, estimates were derived only from women 15-34 and as in most indirect estimation they are probably underestimates (See Preston and Haines, 1991).

22. A significant proportion of Fijians, on the other hand, were infected with *Trichuris* (whipworm) but inexplicably only in a few geographic areas; unless there are very heavy worm burdens this is not a serious cause of morbidity in children (Jelliffe and Jelliffe, 1978).

23. The numbers shown in Figure III-4 are approximate. The Lambert graph is a crude one, measuring 1 3/4" by 3/4". This graph was enlarged and transferred to fine graph paper to recreate a larger graph. To verify this measure, data from vital statistics reports for earlier and later years were used to recreate the same measure. The difference between the two series is undoubtedly created by the fact that the enlarged graph had a very thick line. The source of the Lambert data is not given, but he worked closely with the Fiji Government throughout the 1920s.

24. The period 1900-1902 is used, rather than the period before the O'Brien years, in order to provide relatively comparable comparisons across the different rates. The earliest estimate of child mortality which we have is 1902. Estimates for 1914-1915 are used to measure the middle years of this period as deaths 1-5 are not reported for 1913. Estimates for 1927-1928 are used to measure the end point of the period as 1925 is an epidemic year. The first time 4q1 can be measured using the preferred method for this work is 1928. The Bavadra estimates are therefore used for 1925-1927; see Chapter II.

25. Infant mortality is frequently partitioned into **endogenous** and **exogenous** mortality both in relation to causes and in the calculation of rates (see Bourgeois-Pichat, 1952). In relation to infants, endogenous causes of death include congenital defects, prenatal causes, and factors in the birth process. The argument is sometimes made that "Endogenous mortality has a typically biological character and is resistant to scientific progress, whereas exogenous mortality is viewed as relatively preventable and treatable (Shryock and Siegel, 1976)." Thus endogenous mortality can be expected to decline at a slower rate. Where data are available on timing of death by days of life Bourgeois-Pichat offers a method of partitioning deaths in this way.

26. The countries were Senegal, Nepal, Bangladesh, Pakistan, Haiti, Lesotho and Turkey.

27. The series of CDRs is taken from Robertson (1991) and is for both sexes.

28. These estimates may include some small error as they are taken from different series. The CDRs reported in Robertson (1991) were applied to the population figures to estimate the number of deaths in the year. The number of deaths under 5 years is taken from the current work.

29. The proportion of all deaths which occurred to children under 5 declined by 18% over the period; the proportion which occurred to infants declined by 10%. Ideally these rates should be age-standardized. Age is not reported in years in the 1911 census and deaths are also reported in age groups e.g. "youths" after childhood.

30. Provincial reports suggest that even this small proportion away created hardship in some villages, in particular in maintaining villages to the standards which public health regulations required.

31. By 1910 there was a school in most villages (CP47/38).

CHAPTER IV

THE CHILD WELFARE CAMPAIGN: 1927-1939

1. Introduction

The Child Welfare Campaign (CWC) marked a change in approach on the part of the Government to the problem of high childhood mortality in the Colony. In the previous two decades public health initiatives had centred on sanitation and the development of a medical infrastructure. Childhood mortality (5q0), while lower than in the first decades of the century, was still very high in the late 1920s -- at about 250 per thousand children; a quarter of children died before their fifth birthday. The new campaign proposed to bring the basic principles of child and maternal health to every woman in her village. The aims of the campaign and the methods for achieving them were not significantly different from those proposed by the authors of the Decrease Report, 35 years before. Nor was there any less political will on the part of the Government to bring about a reduction in childhood mortality. What had changed in the intervening period was the level of medical knowledge related to child morbidity and mortality; by the late 1920s it was well established amongst health analysts in the U.S. and Britain that parental behaviour could greatly affect a child's chances of survival (see for contemporary references Ewbank and Preston, 1990; Woodward, 1984). Both countries influenced health policy in Fiji, not least by the medical professionals present in the Colony. In a bold shift in policy, the Government proposed to bring knowledge of what is today called "personal illness control" directly to Fijian women through the CWC (Mosley and Chen, 1984; Basu, 1992).¹ The emphasis was on changing the behaviour of, especially, women rather than simply increased provision of health services.

The CWC met with only partial success. The central question which this chapter seeks to answer is: why were the effects of such a startlingly modern public health initiative so modest? The campaign has been credited with bringing about the relatively low mortality of the early 1940s. However, this perception of the effectiveness of the CWC is in part a result of worsening vital registration in the 1940s, as is shown here. Changes in the age pattern of mortality in this period and the differential decline in the component rates of mortality are also examined. Fiji's

Indian population was not included in the campaign, although their numbers had reached 60,000 by 1921 (CR1921). The end of indenture in 1920 and the choice given to Indian immigrants to remain in Fiji meant that Fiji was to have a large and growing non-indigenous population. But the health of Indian children was seen by the Government as satisfactory. Indeed, the Indian childhood mortality rates became for some in government the "local standard" (MD1938) for Fijian mortality. However, the perception of relatively low Indian mortality was based on a misreading of the available evidence, a perception which was to affect health policy for three decades.

The chapter begins with an analysis of differences in levels and age patterns of childhood mortality for both ethnic groups and the contribution of these differences to the perception of an "Indian standard" by which Fijian mortality could be measured (Section 2). The Child Welfare Campaign is described in Section 3. Section 4 offers an evaluation of the CWC campaign, and others of the period, and analyses the impact of these public health initiatives on the levels and age pattern of Fijian childhood mortality.

2. Levels and Trends in Childhood Mortality: Direct and Indirect Estimates

Indian indenture in Fiji formally ended in 1920. The Indian population according to the 1921 census was 60,634 (37,015 males, 23,619 females and 19,248 children under 10). The majority of the Indian population, after indenture, lived in the sugar growing areas of both of the main islands, typically in smallholdings leased by a single family.

The inception of the CWC took place in a context of belief that the health of the Fiji-Indians had already been secured. Dr. V.W.T. McGusty, an experienced and senior member of the Colony's medical establishment, summarised this view in an essay on the Fiji-Indian population. Both the Indian birth rate and the low IMR, he wrote,

provide satisfactory evidence of the growth of population under suitable climatic and economic conditions, and it has not been found necessary to supplement the medical facilities that are already provided for Indians by that particular concentration on Child Welfare work that was necessary in the case of the native Fijians (MD1932).

Fiji-Indians were seen as accepting and conforming with proffered health initiatives at a faster rate than Fijians. The medical report for Nadroga and Colo West provinces in 1930 notes that the

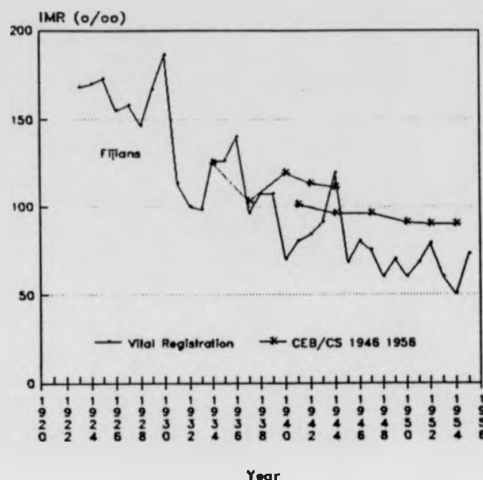
Indians are "more appreciative of modern medicine and always eager to avail [themselves] of its benefits." Another report noted,

Hygiene with the Fijians is... still backward but the Indian settler is making great strides in the right direction....the Indian mother is better trained and has a higher understanding of the care of her children. This, coupled with more nourishing food, are the reasons for a lower death rate than the Fijian (MD1930, Ra province).

The childhood mortality rates of the indentured Indians had been closely watched on the plantations. Rates were high throughout the period of indenture. The IMRs of Indian children of indentured and "free" parents (those whose time of indenture had expired) were 106 and 88 respectively in 1907-1910, a period when there were comparable data over several years.² The consistently lower rates of free Indians appeared to support a government view that the end of indenture would bring even lower mortality. While there was a significant difference in the rates of the two groups, it is likely that this was, at least in part, the result of poorer registration of both births and deaths among free Indians. By the early 1920s the infant mortality rates of the Indians appeared to have fallen to what the Government saw as an acceptable level -- an infant mortality rate of about 75.³

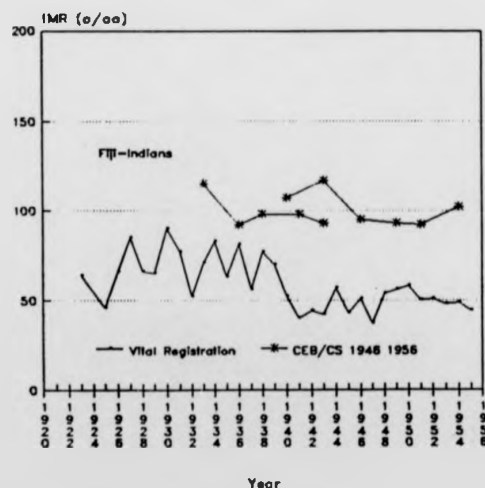
However, extrapolation from the indirect estimates of early childhood mortality derived from the 1946 census (the first census to ask the CEB/CS questions) suggests that Indian vital registration in this period was poor, in contrast to Fijian registration. Direct and indirect estimates of infant mortality are shown in Figures IV-1 and IV-2.⁴ (The derivation of the indirect estimates is described in Appendix B.)

Figure IV-1 Infant Mortality Rates 1923-1954
Direct and Indirect Estimates (CEB/CS),
1946-56 Censuses, Trussell, North Model



CEB/CS estimates are based on the 1946
and 1956 censuses - Trussell Multipliers
Coale-Demery North Model

Figure IV-2 Infant Mortality Rates 1923-1954
Direct and Indirect Estimates (CEB/CS),
1946-56 Censuses, Trussell, East Model



CEB/CS estimates are based on the 1946
and 1956 censuses - Trussell Multipliers
Coale-Demery East Model

Figure IV-1 for Fijians shows that, although there is a substantial difference between the direct and indirect estimates after the 1940s, the indirect estimates are in the same range as the direct estimates in the 1930s and suggest that registration was probably relatively complete. This is admittedly based on the few data points from the 1946 census. (Other evidence for the quality of the vital registration data is reviewed in Chapter II). The comparisons of rates for Fiji-Indians tell a different story: the 1930s indirect estimates of infant mortality are very considerably higher than the direct estimates. Smoothed rates, based on a moving average, show this even more clearly (not shown).

Evidence from the Indian Immigration Reports, which can be used to estimate the age pattern of childhood mortality, would suggest that even these indirect estimates for Fiji-Indians are underestimates. It is now established in demographic research on childhood mortality that deaths to infants in the early days of life are likely to be underregistered and underreported in surveys. In contrast to Fijian childhood mortality with relatively low rates of neonatal mortality, a large proportion of Indian infants died in the first month of life and a large proportion of these in the first week; it is these deaths which are likely to have been underreported in retrospective questions on children's mortality in later years. The Indian neonatal mortality rate (NNMR) for the period 1907-1910 was 96; the corresponding Fijian rate was 45. Of the Indian neonatal deaths almost 60% occurred in the first week (II1910).

The age pattern of Fijian childhood mortality differed markedly from that of Fiji-Indians at later ages. The available evidence shows relatively low levels of Indian child mortality throughout the early decades. This difference in age patterns undoubtedly contributed to perceptions on the part of those in government that Fijians were poorer mothers.

Throughout the child welfare campaign of the 1930s and into the 1940s the Fiji-Indian standard of infant and early childhood mortality was perceived by the government and observers of Fijian society as the appropriate one against which to measure Fijian mortality. This is well exemplified in a report from the Chief Medical Officer in the late 1930s. Comparing IMRs in several colonies with those in Fiji, he asserts:

[these data] show how favourable the Fijian position would be if it could be judged solely by its relationship to that of other tropical countries, but unfortunately there is also a local standard, and the similarity of conditions which it provides makes it, of necessity, the basis upon which any final judgment must be pronounced... (MD1938).

The perception of the ethnic differentials in mortality is also found in many of the scholarly works on Fijian life in this and later periods and, no doubt, fed into the fears of Fijians that the Fiji-Indians would soon be superior in numbers. And while the perceived differentials spurred efforts to improve Fijian life chances they encouraged negative stereotyping of Fijian parental skills. For example, Coulter (1942) writes,

Infant mortality (sic) after the first year is ten times as great among Fijians as among Indians, largely due to malnutrition. As already mentioned, Fijians have no aptitude for looking after livestock or any inclination to keep cows or goats. Consequently, their children are denied milk. [Despite the good work of the child welfare scheme] much...still remains to be done if the Fijians are to survive in competition with the new race from India.³

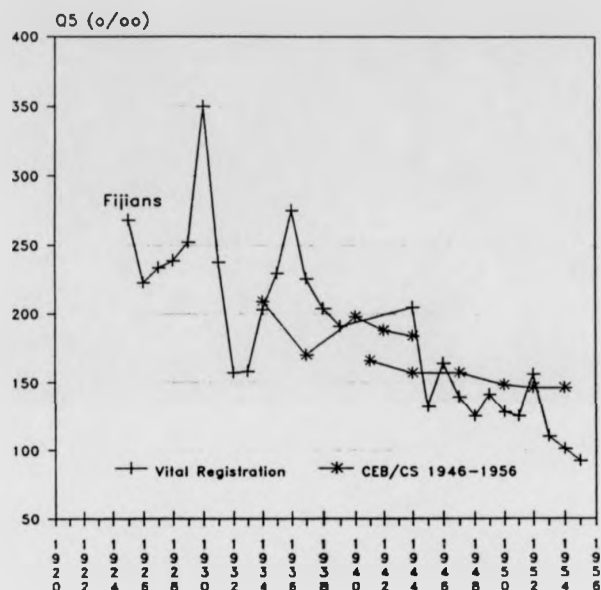
Roth (1953) in his widely cited work "The Fijian Way of Life" wrote,

Whatever may be the cause, there is today, particularly among the women, a lack of the responsibility for taking care of the child up to the age of five years; by then it seems to be able to withstand being fed on unsuitable foods, and to have developed some resistance to diseases likely to be fatal. A high infant mortality among Fijians persists; [the rate] is fairly consistently about twice the infant mortality rate among Indians in Fiji...Scores of these lives could be saved if there were a stronger appreciation by Fijian mothers of the responsibilities of married life.

The "Indian standard" would be one against which the CWC was evaluated (MD1938).

Turning again to the direct estimates of Fijian mortality (see Figure IV-3), we see that mortality remained high throughout the period of the CWC, although there was considerable volatility in rates. The next sections look at these data and the initiatives carried out by the CWC and ask why these rates would have remained so high in spite of the determined efforts of the Government.

Figure IV-3 Childhood Mortality 1925-1954
Direct and Indirect Estimates (CEB/CS)
1946-1956 Censuses, Trussell, North Model



3. The Child Welfare Campaign

3.1. Origins of the Campaign

The Child Welfare Campaign (CWC) began with the objective, in the words of the coordinating medical officer, "of reducing the infantile mortality of the Fijians" which was judged to be "far too high".⁴ Provision for "the adequate care of the child during the first five years of its life" was described as "the most important part of the ... Scheme, as it is during these first few years, especially the critical weaning period, that the greatest mortality occurs (CP45/30)". In its scope it incorporated much of the work which makes up contemporary maternal and child health programmes. However, its success, even though limited, was the result of methods of organisation and delivery which were particularly appropriate to Fiji.

The work began modestly in 1927 in Tailevu province, on the main island of Viti Levu.⁷ The provincial population in 1936 was 9,732, living in 115 villages (CR1936). The medical team was made up of a European Nurse, Nurse Suckling, assisted at first by two Fijian Native Obstetric Nurses (NOBNs) and later by five.

Nurse Suckling had trained outside Fiji as an Infant Welfare Nurse but had previously lived in Fiji. Living among Fijian villagers, she concluded that poor infant care and diet were the important causes of early age mortality. The conflict between the mother's subsistence work and child care meant long periods away from her infant. "Illegitimate" children were thought to be particularly at risk (MD1927). While laws had been enacted to limit the work of pregnant and breastfeeding mothers, these had proved difficult to enforce (MD1930).

Dr. Roberts, the physician wife of the American Consul in Suva, who had experience in child welfare work in Samoa, volunteered to oversee the villages within reach of Suva, beginning in 1928. In the historical record the CWC is identified with her name but she, in the end, played only a part in what was to be a substantial national programme lasting over a decade and finally integrated into the routine work of the Medical Department. However, she played her part with some style and left as a legacy some of the best descriptive writing about the Campaign.⁸

The Secretary for Native Affairs and later Colonial Secretary, the Honourable I. McOwan, is credited with the development of the scheme (MD1930). He was a great admirer of the work of the NMPs throughout the Pacific and gave the essential government support for what many would have assumed had little chance of success. The work was funded from both government and private sources, including money raised by the Fijians themselves and contributions from the Colonial Sugar Refining Company. The CWC at its inception was under the control of the Chief Medical Officer (CMO), a representative from the Office of Native Affairs, and a medical officer charged specifically with Child Welfare Work. In 1932 a Central Executive Committee was established made up of the Secretary for Native Affairs, the CMO, and a newly appointed Governor's Commissioner whose job it was to co-ordinate Child Welfare activities. District Committees were formed in each province to advise on the organisation of child welfare work. The number of Fijian nurses in training was

increased. The medical school curriculum was revised to give greater emphasis to child health. The four-year training course for NMPs included by 1932 obstetrics, infant welfare, diseases of children and public health (The Native Medical Practitioner, 1933). Under Dr. Roberts' tutelage, several student NMPs were made child welfare specialists.

3.2. The aims and methods of the Campaign

The scope of child welfare work was large, and included **inter alia** the welfare of the unborn child and maternal health, as well as village and domestic sanitation. Roberts wrote in 1930,

Not only is an attempt made to help nursing mothers and infants but the larger problems of prevention of disease, sanitation, and public health receive attention. The welfare of the child is affected by the home and village conditions, so the cleaning up of the village and home, water supplies, latrine systems, quarantine and other public health measures become a part of the work carried out in the district (MD1930).

Pregnant women were to be instructed on "all matters relating to the maintenance of her own health, and consequently that of the unborn child (CP45/30)". This instruction would include the importance of a proper diet during pregnancy and lactation and the negative effects of the mother's hard work on the unborn child. Obstetric care was to be improved. Where possible, arrangements would be made for a trained nurse to attend births and give post-natal care; at least one of the village women was to be given some obstetric training. Instruction on infant and child care focused on diet, cleanliness and the importance of a daily routine in a child's life, as well as the prompt treatment of infectious diseases. Responsibility for sanitary work, which had flagged at the end of the 1920s under the NMPs, was to be shared with the Child Welfare workers. Education, inspection and provision of care was to be divided between medical teams made up of European and Fijian nurses and Women's Committees under the overall supervision of the DMO. Over time the NMPs also became involved in Child Welfare work.

The overall objective was "preventive medicine, not the treatment of the sick, except in minor ailments (CP45/30)". Inevitably this created conflict between different parts of the medical service. In 1931 Dr. S.M. Lambert, who was overseeing many of the health programmes in the Pacific funded by the Rockefeller Foundation, observed that there was "lack of co-

ordination...and a tendency on the part of some [child welfare nurses] to usurp the functions of the DMO, NMP and Native Nurse i.e. to practice curative rather than preventive medicine, which is their function."⁹ This conflict would have been especially felt in remote areas only occasionally visited by DMOs and NMPs.

An essential aim was to inculcate in mothers of young children "the principle of self-reliance" in taking responsibility for the health of their children and themselves. However, women generally, and especially members of the Women's Committees, were encouraged to look after the health of all the village children. The Women's Committees were to be established in each village. The four or five "leading women" (MD1929) in the villages who made up these committees would have a number of different responsibilities. The President of each committee, who was in some places elected and in others appointed, would be responsible to the DMO for carrying out his instructions both in relation to individual children and the health and sanitation of the village as a whole. Members were to see that sick children were cared for properly and if seriously ill reported to the village chief and/or an NMP or the DMO. Cases of infectious diseases were to be quarantined or taken directly to hospital. All the children of the village were to be inspected daily for itch, ringworm, eye diseases, and injuries. One or more of the members of each committee was trained to carry out minor medical treatment and were supplied with appropriate medications, dressings and bandages.¹⁰ Members were to record births, deaths and illnesses. The committee was "charged with the duty of encouraging regular feeding of children and assisting parents of sick children to get milk or suitable food." The committee would be responsible for inspecting kitchens, houses and latrines once and week and reporting "dirty premises" to the appropriate officials. Expectant mothers were "to be watched and cared for." The importance of routine was emphasised. The *lali*, the traditional wooden drum, was to be struck at key points in the day to remind mothers of feeding times and as a call for the daily clinic and for bedtime.

The frequency of visits of the medical team to each village varied with its remoteness. In some places villages were visited by the senior member of the team as frequently as twice a month, but in remote areas as infrequently as once or twice a year. The NOBNs visited more frequently for ante-natal and obstetric cases

(MD1937). Organisationally the visits involved a sanitary inspection, a "child welfare meeting" and occasionally a "baby show". Roberts described the child welfare meetings as "the most important work in the district". These involved a baby clinic at which each infant and young child was inspected and a short lecture was given. Lecture topics included child care, sanitation and hygiene, and the management of outbreaks of disease -- including epidemics. Scales were brought on each visit and a log was maintained to record the name, sex, and weight of each child up to two years of age (MD1930); in later years records were kept up to age five. If the rewards of having a healthy child were not enough, shame was seen as appropriate for an errant mother. "After each baby is weighed, if it has gained the mother is given a round of heavy applause -- if there has been no gain or the baby is covered with sores the mother walks back to her place in dead silence (MD1929)". The lectures were intended for all the women of the village, not simply those with young children, and the chiefs.

The fate of other public health and sanitation programmes had hinged on the strength of the interest of the Fijian chiefs and administrators. Roberts wisely advised those undertaking child welfare work that "Unless the interest of the entire village is held and the active support of the chiefs is at the back of the movement little success can be expected (MD1930)".

In the village the lectures were given in Fijian by the native nurses or an interpreter. Parts of Dr. Roberts' lectures read much like the sermons that had become a part of community life.

Many Fijians think the baby can use hard food such as bananas, taro and other things and then the baby dies. The people say God has taken the child, but the truth is the parents have killed it by feeding food before the stomach was ready and the teeth developed, and strong enough to chew properly. God gave teeth to chew food and make it fine... If God intended it to be swallowed in lumps without chewing then he would not have given man teeth (MD1930).

Roberts acknowledged her debt to the Church's methods of instruction:

A new way of presenting lessons in sanitation, hygiene, and the care of infants was introduced during the year when Bible stories were adapted for the lectures. Natives are familiar with these Bible stories and they keenly followed every word of the lecture whenever a Bible story or character was introduced (MD1929).

However these lectures were presented, they were directly relevant to the health of children. The lecture on personal hygiene of mother and child emphasised the importance of "the use of soap and water (MD1929)". "The evils of spitting" both within and outside the house, a problem which had exercised the medical administration for 50 years, were once again addressed. The "Village Rules" which were "frequently brought to the attention of the village" included the following admonitions (MD1930):

- * No food is to be thrown about the village as it brings flies, and flies carry disease
- * Tins, bottles, or coconut shells should not be left about the village as these hold water for breeding mosquitoes. Mosquitoes also carry disease.
- * Bath with soap should be taken daily. Mothers should see the children bathe properly.
- * All food to be kept covered. Dishes to be washed after meals and kept covered from the flies.

In these lectures, "A germ is described as a bug too small to see without a special glass which the medical students at the Suva Hospital use. Fijians are told that germs are not devils that cause disease. Flies are described as enemies who bring illness and death." Some of this material was incorporated in a booklet written by Dr. Roberts, translated into Fijian, and distributed to all the Women's Committees.

A lecture described by Roberts as "very important" and "given to the village over and over" was one on "Feeding the Baby" (MD1930). The problems created by indigestible foods, lack of hygiene in food preparation, and the dangers of the weaning period had been recognised in the Colony for forty years. The belief in the importance of milk in the child's diet and its absence from the Fijian diet had been raised in government reports ever since cession. Roberts wrote,

The great obstacle in the way of regular child welfare work in Fiji is the lack of cows' milk. From experience in Samoa it was found that wherever villages were near Government Stations, and were able to get free milk, there was little trouble in saving the babies through the weaning period. In Fiji where the villages as a rule do not own cows the most trying time and a period where most infant mortality takes places is from the sixth month on up to the point where the child can assimilate root foods and other native products. If the Fijian villages had cows as the Indian families do, the high infant mortality probably would not exist. The secret of the increase in the Indian population as compared with the Fijian population is, I believe, explained by the use of milk by the Indians (MD1929).

Roberts' lecture, "Feeding the Baby", was reproduced in 1932 in the journal "The Native Medical Practitioner" and became available to all Fiji health workers and others throughout the Pacific. Parts of this lecture were practical and within the resources of the mother herself. Finding foods appropriate to the age of the child was stressed as was the importance of a regular feeding schedule:

"Young babies, especially those not nursed, should be fed regularly. The times are: when the sun is up, again when the sun is half way up in the sky, once when the sun is overhead, again when half way down, once at sunset, and when it is bedtime."

But in the main the advice, though nutritionally correct, would have been difficult if not impossible for mothers, acting individually, to follow. The foods recommended for the critical weaning period were largely unavailable. Except for pigs, typically eaten at ceremonial occasions, animals were not kept by villagers. Milk would have had to be bought as would the recommended eggs and rice and sugar for baby cereal. To obtain these foods, which would become widely available after World War II, would have required both considerable motivation and/or available cash.¹¹ Dietary norms, perhaps because of the relatively limited knowledge of nutritional components of foods, had been a persistent blind-spot of medical authorities from the time of cession. Fish was apparently overlooked as an important protein source and yams as a source of vitamins and carbohydrates, highly appropriate for children.

An antenatal clinic was opened at CWM Hospital in 1932. In the following year an article in The Native Medical Practitioner by two European doctors described in detail the care which an expectant mother should receive and encouraged medical professionals in the field to give women the same care as they would receive in the new clinic (Pearce and Clunie, 1933). This built on the training that the NMPs and NOBNs would already have received in their Midwifery lectures -- including measurement of the pelvis, the routine testing of urine, and the treatment of any diseases which might threaten the foetus. Yaws is noted as of special importance along with tuberculosis and it is argued that "yaws is a frequent cause of abortion in Pacific Islanders, and treatment during pregnancy may save the foetus besides improving the health of the mother." Medical workers in the field were encouraged to keep simple records on each woman which

included the number of pregnancies and their "nature", a history of eclampsia, pelvic measurements and basic demographic information.

3.3. Expansion of the Campaign

Child welfare work was taken up by the Methodist Mission in 1928 and a Centre was opened in Ba (Governor's dispatch in CO83/182/4). In 1930-1931, the work extended to other parts of the main island of Viti Levu, to Bua on the other main island, and to Rotuma, in each case under the supervision of a trained European nurse working with Native Obstetric Nurses. While Roberts' work was limited to those villages which could be easily reached by car, of the nurses in the CWC it was said,

They have to face many hardships, travelling long distances in all weathers, and often with poor means of transport. They have overcome difficulties without complaint and have shown the greatest devotion to their duties (CP35/31).

By 1933, the child welfare work had extended to all provinces, but not necessarily to all remote areas; for example the Yasawas as late as 1937 had no CWC. In provinces where no European Nurse was stationed the work was directed by the District Committee or wives of chiefs or officials and supervised by the NMPs. A Women's Committee was organised for urban Suva. By 1937 there were 5 European nurses, 14 Fijian Child Welfare nurses and several NMPs whose work was wholly devoted to the CWC. In many cases the NMPs (N=63) and native nurses (N=58) in the Medical Department were involved in child welfare work where there was no CWC team. In 1938 the CWC was fully integrated into the work of the Medical Department.

3.4. An overview of the progress of the Child Welfare Campaign in its first decade

The foci of the CWC closely paralleled those of the public health movements to improve child health which took place in the U.S. and elsewhere between the late 1800s and 1930. Ewbank and Preston (1990) have outlined the initiatives and programmes which it was thought contributed to the decline in infant and child mortality in the U.S. As they have illustrated, the aim of health analysts and practitioners was to change maternal behaviour through health education.

By the first decade of the 20th century, the mother had become the first line of defence against childhood disease the original primary health care worker. She managed the micro-environment of the young child. No matter how hostile the macro-environment...many steps were believed available to her that would reduce a young child's exposure

to infection and chances of death. Maternal instinct could not be trusted in these matters; all analysts, and mothers themselves, seemed to agree that the mother needed education in proper child care practices.

The "message" of health professionals in the U.S., as in Fiji, was the importance of "good infant feeding practices...of maintaining hygienic conditions in the home" and of seeing a physician when children were seriously ill. Milk in the infant and child diet was strongly advocated and the need for public regulation of milk supplies was recognised. Understanding the value of isolating the sick from the well, the "war on the fly", and the improvement of obstetric practices had parallels in the CWC. However, the CWC, in contrast to the public health efforts in the U.S., was an integrated programme brought to each mother in her village. While the appropriate behaviour and responsibilities of the mother of a healthy child were the focus of most of the teaching, communal responsibility for child welfare was also emphasised. Typically, the European nurse's report for 1937 from the Ba area wrote:

We have endeavoured to teach the Fijians that the Child Welfare Work is for the Community and the District, and not [only] for the individual; and that it is their duty to share the responsibility with the Welfare Worker in every village (NA1937).

Before turning to a review of the quantitative data which can be used to evaluate the effects of this and other public health and medical programmes, it is useful to summarise what had been put into practice as a result of the CWC by 1940. From its earliest days the effects on the outward appearance of children had been dramatic. Few were seen with ringworms and sores (MD1930, 1931, 1938). Minor diseases were effectively dealt with. It was said that these programmes had created a "health consciousness" in the Colony (MD1937). Villages, which had many more health visitors than had been the case in the past, were kept relatively clean; the 1938 Medical Report notes that the Campaign "has raised the standard of environmental hygiene in the villages". Sick children were increasingly being taken to hospital (MD1938). The importance of notification of infectious diseases and quarantine was widely accepted and had, it was thought, prevented the spread of epidemic disease in at least some places (MD1930). The motivated parent would have been well acquainted with what was thought to be the best diet for the young and/or sick child.

By the end of the 1930s births were beginning to take place in modest obstetric units in clinics and hospitals throughout the Colony, although no annual totals are cited in any of these reports. In Ba province a "Native Obstetric Ward" had been built in each district in the province by 1937. Obstetric units were being opened in other provinces as money was raised to do so. In Kadavu, "many" confinement cases were brought to the Provincial Hospital, which provided "cleanliness, a regular diet, and good medical attention (NA1937)". Although the antenatal and postnatal clinics which had opened at the central hospital in Suva were "not well attended" in their early years, the small obstetric unit was working to capacity. Fijian deliveries numbered 94 in 1937 and 81 in 1938; the Fijian population of Suva and suburbs was only 3,471 (CR1936). Home births were increasingly attended by a NOBN or a trained member of the Women's Committee (MD1937).

What is perhaps most surprising is the limited documented resistance to the Campaign, although some aspects of it were received more favourably and quickly than others. For example, parents were reluctant to take children to hospital, even though by the mid-1930s it is likely that all villages and most families had had some experience of hospitals. At least in the case of yaws treatment, this was a positive experience. Some geographic areas put the administrative structure of the Campaign into place more quickly and efficiently than others. Ra province, which at the start of the century had had the highest rate of childhood mortality, provided a continuing positive example of a well-managed child welfare programme throughout the 1930s.

The social success of the CWC was in large part due to an organisational structure which built on the already existing Fijian administration and the traditional authority of high status Fijian women. It was an ingenious combination of tactics which were designed to motivate the individual parent within the context of communal support and pressure. In the 1930s the mother was seen as the parent responsible for child health but fathers were included more prominently as the programme became established (Geeves, 1940). Health administrators noted the positive effects of the programme on the women themselves. In the words of the CMO in 1937, "the status of native women had been raised by the delegation of health responsibilities to native women (MD1937)".

However, the CWC was hampered by limited funding under colonial policies which mandated that colonies should be largely self-supporting (see Whitehead, 1986; Fisk, 1970). Health and welfare programmes, however inspired, received limited financial support from London.¹² This was to change after World War II. During the 1930s the medical teams directly associated with the CWC were still relatively small. The work depended for its scope on a few additional European volunteers, the volunteer work of the Women's Committees, the churches and the NMPs who had wide responsibilities for all areas of individual and community health. As noted, some geographic areas were not covered by the campaign except for the work of the NMPs, the older of whom had no training in child welfare work. However, the training of increasing numbers of Fijian nurses and the modification of the curriculum of NMPs and NOBNs to emphasize child welfare work meant that, by the late 1930s, there were considerably larger numbers of medical professionals with relevant training.

The observations of District Commissioners and European nurses show that acceptance of the Campaign was not universal even after a decade (NA1937 and 1938). For some geographic areas these reports observed that support amongst Bulis and parents is "increasing", and that each year "shows an improvement in the health and cleanliness of the children in most districts". The 1937 Nadroga/Colo West report noted, "I was delighted to find a marked improvement in the children seen and a more friendly attitude on the part of the mothers and majority of the Turagani-Koros and fathers (CP42/37)". The Savusavu report of 1937 documents that progress was made in the "face of almost insurmountable difficulties of superstition and native custom". One unhealthy practice resistant to change was that of

keeping the baby in the house until the father has made the customary feast to the mother's people, which cannot take place until the child is at least three months of age...nearly always more than three months have elapsed before this is done (Nadroga/Colo West, CP42/37).

The DC's report for Savusavu (CP36/38) noted that there were "whole villages where there is an excess of yaws and ringworm" and that in one district "villages are...for the most part bad and the village latrines are inadequate."

One aspect of the country's economic development which may have affected the welfare of children in some villages, especially those which were small and remote, was the increasing

numbers of men working away from their villages (Lal, 1992). This left the communal work, as well as the subsistence work, to be done by women and older men. It was said of some villages in the medical reports of this period that hardly a young man could be found (MD1927, 1928).

Even where the Campaign was at its most successful (e.g. in parts of Bua and Macuata) a large number of children "were lost during an epidemic of diarrhoea" despite attempts to prevent the spread of the disease. There was, as discussed below, an overly rational and optimistic belief in what public health and preventive medicine could achieve in the face of serious childhood diseases.

3.5. Other social and public health programmes

While the Child Welfare Campaign was the most important programme in the 1930s directed at reducing the mortality of children, it was by no means the only one which benefitted children and pregnant and breastfeeding women. In the period from the late 1920s to the outbreak of World War II a number of public health programmes were initiated, in addition to those that continued, such as the small-pox vaccination and typhoid immunisation programmes. (These latter were described in Chapter III). Sanitary districts were formed throughout the country with responsibility for inspection of businesses, homes, ships and sanitation and pest control.¹³ Health and hygiene were introduced into the school curriculum. An attempt at the biological control of filariasis, which was known to be widely prevalent, was undertaken with the introduction of the non-blood sucking mosquito *Megarrhinus splendens* in 1932.¹⁴

The Rockefeller Foundation was active throughout the Pacific in this period and a number of joint projects were undertaken, under the auspices of the Western Pacific Health Service, by the Foundation and the Fiji Government (Lambert, 1941; MD1931, 1932). These projects included the bored hole latrine campaign and renewed hookworm and yaws campaigns which aimed to achieve mass treatment rather than treatment on demand. The bored hole latrine campaign began in 1928 and continued until 1935 with the objective of providing individual families, largely in Viti Levu, with their own latrine. By the end of this period most of Viti Levu had been surveyed and, except where soil conditions were not suited, latrines had been installed.¹⁵

The yaws campaign which also began in 1928 covered all Fijians (MD1931). Two injections of the arsenical drug neo-arsphenamine were given to those over two years of age, and to those younger if infected. This strategy would have left many carriers amongst the young. Yaws cases were still reported and treated in large numbers in the mid-late 1930s.¹⁶

The relative success of the hookworm and latrine campaigns is shown in a re-survey in 1935 of 2,066 persons in areas which were heavily infested with hookworm 10-15 years before. Although in this re-survey 51% were found to be infected, the worm burden was light; "few slides were found in which there was more than one egg per microscopic field ...[although] there were more eggs per slide among Fijians than among Indians (MD1935)". The highest prevalence amongst both Fijians and Fiji-Indians and adults and children was in the Rewa area where soil pollution was "more noticeable".

Other health initiatives included efforts to diagnose and treat eye diseases, and to institute rapid intervention in areas where dysentery was notified. The inspection of school children for health problems was begun. Suva, a fast growing urban area and as such feared as a possible breeding ground of epidemic diseases, was the focus of continuing and extensive sanitation programmes.¹⁷ The inability of the government to mount any serious campaign in relation to tuberculosis, which was acknowledged to be widely prevalent, was argued by the Medical Department to be a consequence of too few resources to undertake what was seen to need a massive effort to establish prevalence, prevention and treatment.¹⁸ It was acknowledged, however, that it was the cause of considerable morbidity and mortality amongst both children and adults. (The relevance to child health is discussed in Chapter V).

The housing stock was also being improved. The importance of this to the Government is reflected in the fact that one of the questions in the 1936 census was devoted to roofing materials. By 1936 30% of houses had iron roofs, which was seen as an improvement over houses made of traditional materials (CR1936). This varied by province; 63% and 44% of houses in Kadavu and Lau respectively had metal roofs in contrast to 15% of houses in Naitasiri and 5% of houses in the Colo provinces. These differences reflected the wealth and administration of the

provinces but also the greater availability of traditional building materials in some provinces than others.¹⁹

While these programmes and the Child Welfare Campaign were acknowledged to have had some effect on child health, especially on hygiene, sanitation and childrens' outward appearance, the overall assessment of the efforts to reduce childhood mortality was gloomy. Writing in the late 1930s, the CMO concluded that despite some successes,

It has to be admitted that twelve years of concentrated effort have brought about no appreciable improvement in the Fijian infant mortality rate... In the absence of any obvious factor operating to the particular disadvantage of the Fijians, their relatively high infant mortality rate and especially the excessive number of deaths of children under five years old cannot be regarded with complaisance as something that is unavoidable, and it must indeed be attributed to a low standard of motherhood in the Fijian women associated with more or less general racial inanition, conditions which are very difficult to combat (MD1938).

The possible causes of this relative lack of success in reducing mortality rates are explored in the next section.

4. Evaluation of the Child Welfare Campaign

4.1. Changes in childhood mortality rates.

The decline in the component rates which make up estimates of childhood mortality -- rates of neonatal deaths, infant deaths and deaths between 1 year and the fifth birthday -- differed dramatically between the period 1914-15 to 1927-28, the start of the CWC, and the period 1927-28 to 1938-39, the last years before WWII.²⁰ In the first of these periods, neonatal mortality declined by only 18%; infant mortality declined by 23% and the period CMR declined by 47%. The possible reasons for these changes have been explored in Chapter III; they include greater access to medical care, changes in the medical infrastructure, the treatment of yaws, and -- of particular importance for the health of toddlers and young children -- better water and sanitation. In the second period (i.e. 1927-28 to 1938-39), the neonatal mortality rate declined by 43%, the IMR declined by 30% and the CMR actually rose. (These numbers are shown in Table IV-1.)

Table IV-1
Fijian Stillbirth and Childhood Mortality Rates¹
(1914-1944)

	SBR	NNMR	IMR	CMR	q5 direct	q5 indirect
1914- 1915	41	51	197	47	333	
1927- 1928	--	42	152	25	232	
1938- 1939	27 ²	24 ²	107 direct 119 indirect	28	200	198 ³
1945- 1946	--	--	74 direct 112 indirect ³	21 ⁴	148 ⁴	186 ³

1. Rates defined in Table II-3.
2. These estimates are based on reports from 1937-38, the only years in the 1930s when both estimates could be found.
3. The 1939 indirect estimate is based on women 30-34 in the 1946 census; the 1945-46 indirect estimates are based on the average estimates of mortality to women 20-24 and 25-29 in 1946. This is an estimate for the period from approximately 1942-44.
4. The CMRs for 1945-46 are taken from Bavadra et al. (1982), and are the bases for q5.

The comparison of direct and indirect estimates of childhood mortality, shown in Section 2 and described in Appendix B, suggests that vital registration for Fijians was relatively good before the war years of the 1940s. Indirect estimates of q5 for 1939 are equal to the direct estimates, 198 as compared to 200. Indirect estimates of q1 are reasonably close, 107 compared to 119. (Indirect estimates of q1 are more model dependent than those of q5.) These estimates are based on CEB/CS to women aged 30-34 in the 1946 census and are probably better estimates than those based on older women -- although these too are roughly in line with the direct estimates for the mid-late 1930s. (See Figures IV-1 and IV-2.)²¹

Assuming relatively good registration, the direct estimates show that between 1927-1928 (i.e. the start of the CWC) and 1938-1939 the IMR declined from 152 to 107, a decline of 45 points. This was a period of high volatility in rates but the IMRs show a fairly steady decline, except in the peak epidemic years of 1930 and 1936. This is supported by indirect estimates of infant

mortality in the early 1940s which suggest rates of just over 110 (see Figure IV-2). Based on direct estimates, q5 declined from 232 to 200 between 1927-1928 and 1938-1939, a decline of 32 points. This relatively high q5 in the late 1930s is supported by the indirect estimates from the 1946 census for the early-mid 1940s of 186. Thus, the decline in q5 is entirely accounted for by the decline in infant mortality.

In a cross-national analysis of childhood mortality rates from the birth histories of a substantial number of country data sets from the World Fertility Survey, Rutstein (1983) argues that "the reduction [in childhood mortality] is more rapid for mortality after the first year of life, and, within the first year, after the first month." ²² His analysis shows, with some exceptions, that countries with high overall childhood mortality (5q0) also have high rates of child mortality (4q1) and that in these countries neonatal mortality makes up a relatively small proportion of overall childhood mortality, while in low mortality countries NNDS are in many cases a substantial proportion of all deaths under five years. Analyses of this type assume that there is, broadly speaking, a general pattern for the decline in childhood mortality which countries follow and that the high mortality countries will follow a pattern which can be approximated by looking at the change in component rates of low and moderate mortality countries. The decline of childhood mortality in some developed countries, England and Wales among them, does show that the decline in child mortality preceded that of infant mortality (Wilson and Oeppen, 1994); however, even in the case of England and Wales the decline in child mortality (i.e. 4q1) occurred at about the same pace as that of infant mortality -- both showed an initial steep decline over a relatively short period.²³ Consistent with Rutstein, neonatal mortality has been shown to decline at a very much slower rate than other components of childhood mortality in some countries. England and Wales are an example (see e.g. Woods et al., 1988). However, this is by no means the case in all countries. Many analyses suggest that there are different paths to low mortality, although some of these analyses are hampered by inadequate (or non-existent) measurement of child mortality, concentrating instead on infant mortality (Palloni, 1990; Kunstadter and Kunstadter, 1990; Halstead, 1985; Caldwell, 1986). Rutstein's own estimates suggest that the relatively low mortality countries in

the WFS had quite different proportional declines in the component mortality rates over the twenty year period before the surveys, the historical boundary beyond which the rates cannot be considered to be reliable or representative. Several of these are shown in Table IV-2.

Table IV-2

Change in Component Period Mortality Rates in Selected Low-Moderate Mortality Countries at the time of the World Fertility Survey.

Country	Years before survey	NNDR	Change %	IMR	Change %	4q1	Change %
Jamaica	15-19	40.6	-40	74.0	-42	25.9	-48
	0-4	23.9		43.0		13.4	
Costa Rica	15-19	36.0	-31	65.4	-19	29.8	-71
	0-4	24.8		53.3		8.5	
Korea	15-19	25.1	-8	63.0	-35	54.4	-72
	0-4	23.0		41.7		15.0	
Phillipines	15-19	22.8	+2	59.4	-2	40.7	-10
	0-4	24.5		58.3		36.8	
Panama	15-19	35.6	-42	61.2	-62	24.7	-48
	0-4	20.5		32.8		13.4	
Colombia	15-19	44.1	-24	95.3	-27	71.6	-71
	0-4	33.5		69.6		41.1	

Source: Rutstein, 1983

Although neonatal deaths remain a large proportion of all deaths under five in the years before the surveys, the proportionate rates of decline at different ages within the same country differ considerably. Palloni(1990) shows several different paths toward lower infant mortality in Latin American countries in this century. His analysis divides the trends in these countries into four broad types, none of which maps on to that for the Fijians. Fijian infant mortality starts at a higher level at the beginning of the century than any of these countries and declines at a faster rate. It would be surprising, indeed, if cross-national comparisons of child mortality (4q1) did not

also show differing paths of decline, as well as different relationships to the decline in infant mortality in some of these Latin American countries but data are limited (Palloni, 1990)

In the next section we look at changes in component rates of childhood mortality in Fiji in relation to the possible effects of the Child Welfare Campaign, and other programmes, on these rates. What could explain a considerable decline in neonatal mortality in this period, a modest decline in overall infant mortality and no decline in child mortality?

4.2. The decline in neonatal and infant mortality

The decline in infant mortality suggested in Table IV-1 is a decline in what is best thought of as the "background" mortality in a period where the rates are highly volatile. In three of the years of this period infant mortality was almost as high as it had been in the second decade of the century. However, the levels of mortality based on indirect estimates for the 1940s suggest that the decline from the levels of the 1920s to those of the late 1930s was a real one.

As Table IV-1 shows, Fijian neonatal mortality declined from a reported 42 per thousand births to 24 between the late 1920s and the late 1930s. The decline in neonatal deaths had a significant effect on the overall decline in infant mortality, accounting for about a half of the decline in the IMR. However, these low rates for both periods suggest that neonatal deaths are likely to have been underregistered or as likely not registered as deaths which occurred in the first month of life. Thus some proportion of what would be considered the PNNDs are likely to be neonatal deaths. The decline in the rate of stillbirths between 1915 and the late 1930s shows that the decline in NNNDs was not simply a transfer of neonatal deaths to stillbirths in this period.²⁴ Stillbirths, too, are likely to have been underreported and deaths within the first day or two of life may have been considered stillbirths because of norms surrounding the deaths of newborns. While recent research on biases in reporting stillbirths and neonatal deaths would suggest that this is likely (e.g. Edouard, 1985), there is little evidence from the 1940s and 1950s from Fiji with which to evaluate the stillbirth and neonatal death rates in the late 1930s. The Fijian neonatal mortality rate in the mid-to-late 1950s, based on the FFS, is 28, which is low. However by this time considerably more births were medically attended. It has, then, to be asked whether these low

rates of neonatal mortality in the 1930s are plausible given the high rate of childhood mortality. While there is limited evidence that would shed light on this, it is noteworthy that there are high mortality countries in relatively recent times with relatively low neonatal mortality. Senegal is one. In the 0-4 years prior to the WFS in Senegal, q5 was estimated at 262; the NNMR was estimated at 50. NNDs were 19% of deaths under five. This contrasts with Pakistan in about the same period with q5 estimated at 207 and the NNMR estimated at 80, where NNDs were 39% of deaths under 5 (Rutstein, 1983). Since there is no reason to believe that there was a change in the reporting of either stillbirths or neonatal deaths in Fiji in the 1920s and 1930s relative to the earlier periods, the numbers can be taken as representing the trend if not the exact level of neonatal deaths.

We can seek a probable explanation for the decline in the NNDR by looking at the causes of neonatal mortality in relation to the work of the CWC. The primary causes of neonatal mortality are poor antenatal care of the mother, congenital anomalies, factors related to the birth process, risks to premature and low birth weight babies, and the prevalence of diseases of very early infancy such as neonatal tetanus and whooping cough (Warley, 1978; Walsh et al., 1990). Nothing in the historical record suggests that prematurity or low birth weight babies were common among Fijian women; problems against which even relatively good midwifery may be insufficient for the infant's survival. Writing in the Native Medical Practitioner in 1933, Pearce and Clunie observe that "Native women have very little trouble during child birth." Congenital factors are also relatively rare. The only disease of very early infancy that was prevalent in this period, and then only in some years, was whooping cough (the disease environment is discussed below). This suggests that the decline in the NNDRs is best explained by the impact of the CWC in promoting better antenatal and postnatal care, and safer birth practices.

Primary objectives of the CWC were the care of pregnant and breastfeeding women and births assisted by either a trained nurse or a woman with some training in safe birth practices. The demand for the services of the NOBNS was unabated. By 1938 there were 58 Native Obstetric Nurses working in the provinces and provincial medical centres; Fijian births in the late 1930s

averaged 3600. Members of the Women's Committees were also being trained in what were then modern methods of childbirth. In a paper in 1940 describing the CWC, Nurse Geeves, one of the European child welfare nurses, reported,

[Women from the village committees] ...attend normal confinements when unable to get the trained Native Obstetric Nurse, having instructions therefore in a printed lecture which they follow (Geeves, 1940).

In this same paper she noted the decline in maternal mortality as a result of these changes in care of women and birth practices, although these numbers were not reported for this period. There was increasing demand for places for hospital deliveries by women and a call for full maternity units amongst some of the medical establishment (MD1927, 1930, 1937, 1938).²⁵

The acceptance of the NOBNs by the village women in the 1930s contrasts with the resistance to their work when they were first introduced in the villages in 1909 (as described in the last chapter). The Child Welfare Campaign re-launched the idea of bringing obstetric care to the villages and educating women about appropriate prenatal and postnatal care, in opposition to traditional birth attendants or "wise women".²⁶ And this time it was accepted.

What is likely to account for the success of the Native Obstetric Nurses twenty years later and the shift in values related to maternal care and child birth practices? The increase in the numbers of literate women is a possible explanation, although, as was seen in the previous chapter, the levels of literacy changed only moderately between 1911 and 1936 (see Table III-2). The standard of education in the predominantly church-run schools may have improved. There had been some important medical successes in the previous decades, especially the treatment of yaws and ringworm, which would have increased confidence in Western medical practices. However, the most likely explanation is that high status women, and women of chiefly status in their own right, became involved in child welfare work and in the women's committees.²⁷ In a culture as hierarchically structured as the traditional Fijian culture, there would have been little scope for rejecting the encouragement of these women to accept changes in infant care, in sanitation and in practices related to their own health. The individual woman was not required to choose non-traditional medical and obstetric care on her own, the

decisions being, in part, taken or at least supported at the communal level.

Other factors which would have contributed to declining neonatal mortality were the increasing standards of education for NMPs and NOBNs, combined with supervised hospital experience. The 1930s saw considerable gains in the quality of the formal education of Fijian medical professionals with the opening of the Central Medical School in 1929 (Lambert, 1941; Guthrie, 1979).

The fact that neonatal deaths may be underreported makes it impossible to estimate the exact level of post-neonatal mortality. Given, however, the probable low rate of neonatal mortality by the end of the 1930s, it must be asked why post-neonatal mortality was as high as it was. Some of the same factors which affected the decline in neonatal deaths, would also have contributed to the decline in post-neonatal deaths. In general healthier women would have given birth to healthier infants. Other factors (such as the delayed introduction of solid foods; the introduction of foods appropriate to the very young but still nursing infant; cleanliness in the home and in food preparation) should have positively affected infant health. However, as the analysis in the next section shows, the period would have been an unhealthy one for infants who had lost their maternal immunities; whooping cough and new strains of dysentery were prevalent for which there were no maternal immunities. In addition, as we shall see, appropriate food options for mothers who introduced solid foods early to infants were limited.

Although the CWC had stressed the importance of regular breastfeeding and the negative effects of heavy work during pregnancy, there is nothing in the historical record which suggests new ways in which women managed subsistence work and childcare in areas where a conflict was known to exist -- e.g. agricultural areas such as Tailevu. The fact that the many later reports on the campaign no longer mentioned the heavy burden of women's work suggests that there had probably been changes in comparison with previous decades. It is noteworthy, however, that Lauan women had always had a favourable distribution of work, and the same was probably true of women in Kadavu -- the two provinces with the lowest IMRs in the late 1930s.²⁸ It is possible that the changes in infant and child care advocated by the CWC were more compatible with some Fijian sub-cultures than others.

4.3. Child mortality in the 1930s

The evidence suggests that mortality between the ages of 1 and 5 (4q1) was as high or higher for most of the 1930s than for the non-epidemic years of the late 1920s (1926-1928). The rates are shown in Table IV-3.

Table IV-3

Period Mortality Rates (Direct): 1927-1939 (Fijians)

Year	IMR	CMR	4q1	q5
1925	173	31*	115	268
1926	155	21*	80	222
1927	158	24*	90	234
1928	146	27	102	239
1929	167	30	113	252
1930	186	60	210	350
1931	113	28	103	238
1932	100	15	57	157
1933	98	17	66	154
1934	126	27	102	203
1935	126	32	119	230
1936	140	45	163	275
1937	96	33	121	226
1938	107	31	115	205
1939	107	25*	94	191

* Taken from Bavadra et al. (1982).

The most important cause of this high mortality is undoubtedly the repeated epidemics throughout this period. But other factors, the social factors analysed here, will have contributed to the failure of the CWC to influence child mortality or to bring about its speedy decline even in the healthier environment of the early 1940s.

Table IV-3 shows the considerable variability in the CMRs between the late 1920s and the late 1930s, ranging from 15 to 60. The values of 4q1 derived from these show that in seven of the 13 years child mortality was as high or nearly as high as infant mortality. That the repeated epidemics of the late 1920s and 1930s were important causes of the high rates can be seen by mapping the epidemics and outbreaks of serious diseases with the mortality rates. These are shown in Table IV-4, along with the period mortality rates.

Table IV-4: The timing of epidemics and associated mortality

1927	Measles epidemic "of a mild nature"
IMR 158	Whooping cough "prevalent"
CMR 24	Broncho-pneumonia (Rewa)

1928	Influenza "severe outbreak"
IMR 146	Diarrhoea extensive epidemic amongst Fijian children
CMR 27	

1929	Dysentery (Shiga) "widely prevalent", "great virulence"
IMR 167	Whooping cough "rather prevalent"
CMR 30	Influenza "mild type with little broncho-pneumonia"

1930	Dysentery (Shiga) 1929 epidemic continued
IMR 186	Whooping cough "prevalent" in some provinces
CMR 60	Dengue fever

1931	Dysentery (Shiga) "milder than previously experienced"
IMR 113	Influenza
CMR 28	Dengue fever

1932	No serious epidemics
IMR 100	
CMR 15	

1933	No serious epidemics
IMR 98	
CMR 17	

1934	Whooping cough "epidemic which spread through the
IMR 126	whole colony"
CMR 27	Dysentery "prevalent in rural areas outside Suva"
	Influenza "mild" epidemic

1935	Dysentery (Shiga) "prevalent" in some areas, less
IMR 126	severe than 1929-30.
CMR 32	Influenza
	Whooping cough

1936	Dysentery (Shiga) "prevalent" in some areas
IMR 140	Measles "epidemic throughout the colony"
CMR 45	Influenza "epidemic"
	Pneumonia (increased following Influenza and
	Measles)
	Whooping cough

1937	Dysentery "exceeded usual seasonal prevalence in
IMR 96	several districts"
CMR 33	

1938	Whooping cough "prevalent throughout the colony
IMR 107	throughout the year"
CMR 31	Infantile Diarrhoea (Bua)
	Dysentery (Bua)

(Note: quotations taken from annual Medical Reports)

Most of these years are characterised by epidemics of more than one of the serious diseases of childhood -- dysentery, whooping cough and measles. Dysentery was unusually severe in the years 1929 and 1930 and there is no particular explanation to be found in changes in environmental standards. Major epidemics of Shiga dysentery, with high case-fatality rates in children, which occur and then decline without obvious cause have been documented in a number of countries (Black, 1984). The infective dose is small and the highest rate of infection is found in children between the ages of 2 and 4 (Black, 1984). Breast feeding protects against Shigalla infections in the very young but in these dysentery-epidemic years whooping cough was also prevalent, increasing the rate of infant mortality (Mata and Urrutia, 1978).

The relatively long period in which measles was either highly localised, as is probable in 1927 given the low rate of the CMR relative to rates in other epidemic years, or not present would have meant a build up of susceptibles in the 1930s. In Fiji this usually led to increased child rates mortality in the next epidemic, as was the case in 1936 (although in this year confounded by dysentery deaths) and the measles epidemic years of 1946 and 1957. The 1937 Medical Department Report observed that "Fijians appear to have acquired a much greater degree of immunity to measles than was formerly the case." There is no evidence for this among children; widespread epidemics were accompanied by increased child mortality **relative to the years surrounding**. But measles-related mortality may have come from other diseases resulting from the depressed immune system and not the outbreak of measles itself (see e.g. MD1927 and 1936; Mims, 1987).

It would be a mistake, however, to attribute the high infant and child mortality of the 1930s solely to the disease environment. The goals of the CWC included increasing the resistance of infants and children to diseases and increasing the chances of survival of children when seriously ill. Two factors which it was hoped would bring about these changes were a more suitable child's diet, especially the weaning diet, and the increased use of medical facilities when children were ill. The variable success of the CWC in relation in achieving these changes in behaviour is analysed here in some detail not only because these factors are important in evaluating the CWC but also because the failure to bring about changes of behaviour in

these areas is likely to have played a part in maintaining the high levels of mortality which existed in the 1940s.

4.4. Resistance to changes in the diet of children

Turning first to the child's diet, there was a new interest during the late 1940s and 1950s in the nutrition of both major ethnic groups in the Colony which resulted in several nutrition studies -- the first modern studies in Fiji (Parkinson, 1991b). By this time knowledge of food composition was significantly greater than it had been in the 1920s, at the inception of the CWC. The 1950 medical report includes a detailed analysis of the nutrition of both Fijians and Fiji-Indians.²⁹ The conclusions of this investigation suggest that there was little change in the diet of children between 1927 and 1950, or, indeed, between the time of the **Decrease Report** and 1950:

These findings...do not indicate that the intake of animal protein is optimal for all sections of the native communities. The vital statistics for Fiji contain disquieting figures for Fijian infant mortality in the post-weaning period...We have no doubt that the root cause is the failure to provide an adequate amount of protein food when the baby is weaned. The baby, in the period when it is suddenly called on to adapt itself to foods having a low protein content such as dalo, coconut and banana, loses condition and becomes a prey to intercurrent infection which is the immediate cause of the high death rate. The lower rate of infant mortality among the Indians at this period of infancy is an index, in our opinion, of their traditional high regard for milk as a valuable food for the infant, for practically every Indian child receives a ration of milk...We were given a list of the protein foods which the Fijian eats...we learnt that milk is in general not an acceptable food to the Fijian, since he has never been accustomed to it.

Recommendations: ...Milk seems to us to be an urgent requirement for the Fijian infant in the post-weaning period, the toddler and the pre-school child...(MD1950)

What can account for this resistance, if resistance it was, to a change in diet of young children, especially the weaning diet?³⁰ The Fijians, sometimes under duress, had accepted (and themselves paid for) many of the schemes suggested by Colonial Governments. The apparent increase in the health of women probably reflected a better diet for them -- a diet which was carefully prescribed by the Child Welfare workers (see, for example, Geeves, 1940). Despite Fisk's characterisation of Fiji as a country of "subsistence affluence" in relation to food (Fisk, 1970), Fiji did not have, as we have seen in Chapter I, a wide range of high protein foods easily adaptable to the young child's diet. The traditional diet did provide the necessary

elements for a healthy child's diet and these were within the provenance of most families -- but the balance for the young child must be a careful one and this balance was either unknown, not clearly taught by the CWC, or resisted by parents. The unrelenting focus on milk (and cereals) for children was clearly mistaken in the face of stubborn cultural resistance. Just how unrelenting this was can be seen from an analysis of the dispatches, reports and even the annual speeches of the various Governors, one of which to the Great Council of Chiefs echoes that of the first Governor of the Colony 60 years before:

Child Welfare is not a matter for women alone, it is a matter of vital importance to the Fijian race, and I must insist that every chief makes it his business to assist in the work. It is strange to me to find that cattle are rarely kept by Fijians and I urge the importance of a good and clean milk supply to the health of your children. I am also told that there is much room for improvement in the preparation of food for young children (CP36/36).

The response of the Council of Chiefs, similar to others made over many decades, showed polite agreement, though the exhortation was then largely ignored:

We entirely agree with the remarks made by Your Excellency in regard to the keeping of cows for the purpose of providing our children with milk, and attempts are being made to gradually instil the idea into the minds of the people. The ignorance of native mothers regarding the essential preparation of milk required by a child is a difficulty, and we hope that the Government will see fit to issue instructions for their guidance.

It was not easily within the power of individuals or individual families living in a communal environment to buy and support cows. Fijians did not have an interest nor was there any evidence of an aptitude for the pastoral care of animals. Throughout the decades of colonial government they had made this clear. The Government had other options, which, with its remarkably tenacious concern with mortality, it could have exercised. One of these was a closer analysis of the appropriate infant foods from the traditional diet, as was done for the prescribed diet of pregnant and lactating women. This would have included communicating the importance of fish as a protein source in the child's diet and confronting fish taboos for children.

4.5. Barriers to taking children to hospital

Although many reports show that children were increasingly being taken to hospital when they were ill, several noted the difficulty health practitioners had in convincing parents to do

so swiftly, or to consult a doctor or NMP. Typical of these is the report of the experienced Nurse Geeves (1940). She wrote,

I find it very necessary to continually urge the calling in of a doctor in a case of sickness as the parents are prone to neglect doing so and thus lose a number of children.

Given the acceptance of much of the message of the CWC by parents, how can we explain the resistance on the part of some to the timely seeking of medical treatment? There are a number of possible reasons for this reluctance which do not constitute the neglect of which many Fijian parents were accused.³¹ The most important of these are 1.) the fear of punishment or embarrassment for not having sought medical help more quickly; 2.) the lack of access to medical facilities for those living in isolated parts of the Colony; 3.) competition between traditional and Western healers and explanations of disease. These are considered in turn.

Native Regulations had in the past included, and included in the 1930s, many related to health, including yaws treatment, notification of illnesses, and quarantine for some diseases. The NMPs, unlike the CWC workers, had as one of their many roles the enforcement of these regulations. Despite the almost military campaign style of Dr. Roberts, the message of the CWC was largely a nurturing one. In contrast, much of the earlier public health work had included an element of threat; indeed at times it had included punishments and fines for breaking public health regulations. (The CWC had it should be noted also used shame as one of its methods of attaining conforming behaviour, as we have seen.) In addition, for some diseases, such as tuberculosis and leprosy, there had been enforced periods of treatment under the authority of the NMPs and DMOs. This meant that the ill were separated from their villages, with the fear that they might die in a foreign place. The fears on the part of some parents are described by one of the travelling NMPs for Macuata writing for the NMPs' journal:

During the past few weeks the nurses have walked to every village in the hills and they have sometimes found when the children are brought in for inspection that only those who are well or have minor ailments are brought to them, and the mothers have hidden those who have yaws, scabies, and ringworm. It is only by going from house to house that these sick children have been discovered...Most of the parents know that they should take their sick children to hospital or get medical assistance for them, but with this knowledge they are afraid that the Native

Regulation or law will take its course and so they keep their sick children from seeing us (Lewanavanua, 1937).

Similarly Quain (1948) writes of his area of Bua "Diseased people are usually afraid to apply for medical service for fear they will be detained against their will at the medical station."³²

The problems of access to medical centres and the difficulty of transport were acknowledged by the Medical Department (see, for example, MD1927, 1928). In the mid-1930s, the NMPs (on average there were 65, of whom several were based in Suva at any one time) served over 1000 small villages. While there were some 30 medical dispensaries (most under the supervision of an NMP) and 15 larger hospitals (see MD1933) many villages were at a considerable distance from any of these (See Map 3).³³ Travel from the distant villages often meant finding river transport as well as sea transport or travelling with the ill child over poorly defined paths. In addition children and other family had to be left behind; and there was no way of knowing if the NMP or DMO would be in attendance when they arrived.³⁴ Quain (1948) writes of his area of Bua,

[For those choosing to go to the medical station] Living at the medical station is a hardship because it means that relatives must carry food down ten miles of slippery path... there are no facilities for feeding patients.³⁵

By their extensive use of medical services the Fijians had shown that they were not resistant to many types of Western medical care but they were selective.

Given the effort necessary for many to travel to a hospital or dispensary, villagers no doubt used their own calculus of risk in relation to illness episodes. This calculus is often not fully explicated in the analysis of decision-making in relation to medical alternatives, even in developed countries (Royal Society, 1992). Understanding this calculus within and across cultures is of considerable importance both in understanding why parents fail to seek medical attention and in helping to explain how, for example, parental education or income might affect child survival. What is needed is knowledge of what parents consider "acceptable risk", and how this is calculated in relation to an illness episode. Part of this calculus involves the fact that the very great majority of the illness episodes of children involving potentially life threatening illness do not actually end in death, even without medical intervention. For example, young children have repeated episodes of diarrhoea; in Sub-Saharan

Africa the median incidence is estimated at 4.9 per year in children under 5 years (Kirkwood, 1991b). Young children also experience repeated respiratory illnesses. The great majority of children under 5, where exposed, will acquire both measles and pertussis. Only a very small proportion of these episodes end in a fatal outcome (van Ginneken, 1990; Kirkwood, 1991a). Distinguishing what are likely to become fatal episodes from the others is difficult even for the medically trained. Although community-based estimates of the case-fatality rates of serious infant diseases are limited, estimates suggest that as few as 3% of whooping cough, 3-5% of measles and 1.2 % episodes of diarrhoea end in death (Rodrigues, 1991; Muller and van Ginneken, 1991).¹⁶

The parental choice, then, not to travel what might be long distances for medical care, or otherwise expend energy and resources, will reflect assessments of risk which are informed by experience rather than "neglect" or "indifferent parental control" (MD1940) as some in the Colonial Government labelled what was perceived as inaction on the part of parents. What undoubtedly varies within and across cultural groups and perhaps by level of education of parents is what is considered "acceptable risk" and probably also the process of risk assessment (see e.g. Orubuloye and Caldwell, 1975). This depends in some cultures on such factors as birth order and sex of child; although there is no evidence that the latter was the case in Fiji (Basu, 1992; Ware, 1981). It is also related to access to medical facilities. The calculation of risk is clearly related to the level of commitment to the child's survival (Simons, 1989) and to what medical knowledge parents may have.

This process of risk assessment appears to have differed for Fijians and Fiji-Indians in the 1930s. The more poorly educated Fiji-Indians apparently sought Western medical advice sooner than Fijians, often in relation to minor medical problems, and were more likely to accept Western medicine than Fijians. In part this is explained by the fact that proportionately more Fijians than Fiji-Indians lived at some distance from and/or had more difficult access to medical centres. Fiji-Indians lived in sugar growing areas and were more likely to live along roads. And Fiji-Indians are less likely to have had the extensive network of native healers that were part of their traditional culture. As the evidence in Chapter III shows, hospitals were

well-used by Fijians. This may not have been the case when children were very ill and/or seeking Western medical attention was delayed through fear of incarceration.

4.6. Use of traditional healers

The Fijians had access to several kinds of traditional healers with a large pharmacopeia of medicines and kinds of treatments as well as "witch doctors" and sorcerers. (The use of traditional healers and their roles are described by Sahlins (1962) in his book on Moala as late as the 1950s.) That Fijians frequently used traditional healers is noted in government reports as well as in more personal accounts. Vakatawa, an experienced NMP, wrote in a 1939 issue of the Native Medical Practitioner an essay entitled "What the Fijians Believe as the Cause of Disease",

The Fijians strongly believe that all diseases are caused by evil spirits, as a punishment of their wrong doings or maybe the wrong doings of their ancestors, or maybe that some one is jealous of some one else and he has made some witchcraft to make the other man die. Such diseases are only cured by a man with a stronger magic...We, as NMPs, have a lot of difficulty in the field as the Fijians will not believe in Western medicine and will, in the case of someone sick, go to a witch doctor first instead of the NMP and very often they are too late for any medical assistance...

Vakatawa describes a number of cases in his recent experience and concludes,

[witchcraft is resorted to] whether there is a NMP stationed [in the district] or not ...This Fijian belief in witchcraft is not only among the uneducated class, but even those that are educated.

Quain (1948), too, observes:

Native medical remedies are used constantly, and a strong sense of guilt and mistrust has developed toward the medical officer, whose job it is to ferret out these practices and outlaw them; an invalid who has tried native remedies will fear the official medical service lest his sin be discovered.

The use of witchcraft, in contrast to other kinds of traditional medicine, appears to have varied geographically and was more likely to be found in more remote areas of the main islands.

Cleland and van Ginneken (1988) write in relation to education and the use of health services:

The shift from traditional to modern or Western medical treatment by the educated is not a complete transfer of allegiance. There is abundant anthropological evidence

that belief in and practice of entirely different systems of disease classification and therapy can co-exist...But the correlation between exposure to formal schooling and propensity to resort to Western medicine is clear-cut. It is thus reasonable to expect that the advantage conferred by education may be greater in settings where modern health facilities are available.

The evidence from Fiji -- well into the 1950s and later, as traditional medicines and treatments are often used today -- is that both types of medicine were resorted to. Although it is possible that the better educated or those of high status may more quickly have sought Western care, there is no evidence of this.

In summary, Fijian parents in some cases arrived "too late" to hospitals and doctors, for a number of reasons. These included fear of punishment or embarrassment, barriers to the use of Western medical facilities, and the use of traditional healers.

4.7. Conclusion

The decline in neonatal mortality in a period which saw only modest changes in overall infant mortality and no change in child mortality was the result of appropriate medical knowledge delivered at the village level as a result of the CWC. Older infants and children were more vulnerable to the many epidemics of the period than were neonates and barriers to the use of Western medical care meant that medical treatment in many cases came "too late".

The reluctance on the part of some to seek Western medical care for a child who was ill seems to contradict the many reports that the CWC, and other health programmes, had made considerable progress in relation to the health of children and mothers and that the programme, on the whole, was accepted and supported. One possible explanation for this is that the explanatory framework for disease as compared to the explanatory framework for health were accepted by the Fijians as being different. The Fijian could explain the cause of illness and disease in several ways, which might include aspects of traditional belief such as spirits, and aspects of modern belief such as the germ, fly and mosquito. The "cause" of health, as distinct from the cause of illness on the other hand, was explained by Western medical practitioners as the result of specific behaviours which the mother/parent was asked to do. That is, the explanation of health and the behaviours necessary to achieve it was perceived as

different from the explanation of illness and the necessary behaviours to achieve the absence of it -- which was not necessarily "health". Explanations of the causes of disease from Western medical practitioners and the behaviours they considered necessary when a child was ill were competing with traditional explanations and beliefs about diseases. In relation to the **prevention** of disease, that is the ideology of health, the CWC and the NMPs were on relatively new and uncontested ground. In the promotion of health, traditional authority, in the form of the participation of leading women in the villages in the CWC, was united with the authority of Western trained medical workers, who found a better or quicker reception of the preventive aspects of their science than the curative aspects. This may also help to explain the relative failure of the CWC to effect a change in the traditional diet for children, which was the aspect of the new ideology of health most in conflict with traditional norms, whereas generally parents were making attempts to conform to the new ideology of health. Mothers and women generally may have had greater autonomy in choosing health-related behaviours which did not challenge traditional beliefs, including seeking antenatal care when pregnant, than in those behaviours which did make these challenges and which additionally required the support of men, such as carrying a child some distance to hospital or keeping a cow for milking.

Given the high level of literacy among both Fijian women and men (see Table III-2), it might have been expected that the child welfare and other health-related programmes would have had a greater impact on mortality. The Child Welfare Campaign depended on a particularly high level of literacy among the women on the village-based committees; considerable health-related material was distributed in the form of booklets and leaflets to these committees. It is outside the scope of this work to establish the level, content and quality of education which was widely attained but it is likely that it was at least that of lower primary school. By 1936, almost all women who could read could also write. Many schools had maps and simple geography was taught (Brewster, 1922). Basic hygiene had been a part of the school curriculum at least from the end of the last century; this had been a recommendation of the authors of the Decrease Report but it is likely that mission schools included, if not preached, the importance of hygiene before this. This was again emphasised

by the CWC. Education, like health care, was available to all, although there were probably limitations on access largely determined by the location of the village and presumably by parental choice in allowing children to go to school. In the 1946 census only 18% of adult Fijian women of all ages reported never attending school.

There is no qualitative or quantitative evidence on the relationship between individual educational attainment and the morbidity and mortality of children or health care decision-making by parents for this period. However, among the better educated, or in provinces where the levels of education were generally high, it might have been expected that the changes in the weaning child's diet would have been made in conformity to the prescriptions of the CWC.

Research from other developing countries today, based on more recent mortality data and therefore in environments with greater health care options, suggests that the effects of maternal education are stronger on child mortality than on infant mortality (Cleland, 1990; Cleland and van Ginneken, 1988). If there are education effects which might explain the trends in these Fijian data, they are likely to best explain the willingness to accept the Native Obstetric Nurses. However, as noted above, this may be equally well explained by other factors. More importantly, the ethnic differentials in child mortality are clearly not in agreement with what is the generally accepted relationship between maternal education and survival after the first year of life. Fiji-Indian parents, a group with extremely low levels of literacy, achieved considerably lower levels of overall childhood mortality than Fijians; importantly, the levels of mortality between ages 1 and 5 were much lower. In the late 1930s, 4q1 indirectly estimated was 90 for Fijians and 31 for Fiji-Indians. Based on the 1946 census, fewer than 20% of Fiji-Indian women were reported to be able to read in any language and 73% had never attended school.

Caldwell (1986) shows the dramatic effects on estimated life expectancy (as measured by the expectation of life at birth associated with a given infant mortality rate) of the interaction of education and access to health services in a reanalysis of the data of Orubuloye and Caldwell (1975). The gain in life expectancy for educated parents living within easy access of a health centre was several times that of illiterate mothers with

easy access to such facilities or educated mothers without easy access. Well-educated Fijian parents living in close proximity to health facilities may have had different patterns of use from others. This possibility, even likelihood, can only be assessed with individual level data (see last Chapter VI).

Amongst the Fijians, high levels of literacy and widespread knowledge about good health care practices, in a relatively hostile environment for child health, were insufficient to translate prescriptions about health into reality. However, a more positive way of assessing the overall effect of the many public health programmes on the health of children is to compare the mortality rates of children in the 1930s, one of the most unhealthy decades since cession, with the mortality rates in the equally unhealthy disease environment of the late 1880s. Whereas in the earlier period, half of all children died before the age of 5, in this period fewer than a quarter did so, in the worst years. Without the CWC, and the extensive system of medical care which existed, mortality is likely to have been much higher in this period.

What would ultimately bring about a rapid and permanent reduction in childhood mortality was modern medical technology -- including antibiotics and immunisations -- and easier access to medical care. The introduction of cow's milk into the child's diet was never a factor in bringing about the decline in Fijian childhood mortality.

1. "Personal illness control" refers to behaviours which prevent as well as cure health problems. A woman's care of herself during pregnancy, attention to the personal hygiene of family members and a proper diet for the young infant are among these.

2. The annual Indian Immigration Reports produced by the Government included numerical descriptions of the Indian population which are remarkable in their detail. However, the information reported in each year, and the categories used to report data, change from year to year in relation to what appear to be the new ideas of the official in charge. Mortality is sometimes given for indentured and free but sometimes also cross-classified by those born in India as compared to those born in Fiji. Infant mortality is sometimes based on the births in the calendar year, sometimes births in the last 12 months. These reports are not always internally consistent from table to table.

3. "Acceptability" appears to have been measured by levels of mortality which were known or believed to exist elsewhere in the Colonies or in the U.K. In some cases these perceptions were the result of an administrator's experience (e.g. Sir Everard in Thurn's comments in 1906 about how "well off" the Fijians were in comparison with other colonies in which he had served (CO83/82)). From time to time mortality rates would be published from other colonies and for the U.K. (e.g. Decrease Report; MD1938), which suggests that these were shared amongst colonial administrators as health indicators. Infant mortality in England in the first decade of the century had been considerably higher than the Indian rates in the late 1920s in Fiji (Woods et al., 1988) and this would have been known by administrators.

4. The CMRs for the years 1925-1927 and 1944-1947 are taken from Bavadra et al. (1982). See note 13 of Chapter II.

5. His analysis of the mortality numbers is wildly off. He writes, "In 1937, a representative year, the deaths of native children under five years was 33 percent; that for children over one year and under five was 12.2 percent; for children under one year it was 21.1 percent." The IMR based on registered births in 1937 was 96. The number of births was 3432; the number of deaths under 1 year was 331 and the number of deaths between 1 and 5 was 371. Indirect estimates suggest that the IMR about this time was between 103-119. 4q1 was between 52 and 61 and q5 was between 150 and 173. The comparable Fiji-Indian q5 was about 125.

6. The Child Welfare Campaign began as the Infant Welfare Scheme and was variously known in the government reports of the period as a campaign, a programme and simply as child welfare work. This reference is to a report from the Acting Chief Medical Officer to the Legislative Council (CP45/30).

7. The Governor's dispatch to London of 6 July, 1928, reported: The Province of Tailevu was selected for the experiment as being the largest, the most thickly populated, and from the native point of view, the most important in the Colony. It also had the advantage of being within easy reach of Suva, thus making it possible to keep the experiment under close observation (CO83/182/4).

8. Descriptions of the Child Welfare Campaign, apart from those of Dr. Roberts cited here, can be found in the Governor's dispatch to the Colonial Office, July 6, 1928 (CO83/182/4), and in Geeves (1940).

9. See Fourth Annual Report on Western Pacific Health Service, 1931, in MD1931.

10. These medicines included 5% solution of argyrol and droppers for eye conditions; strong salicylic acid iodine solution for the treatment of Tokelau ringworm (*Tinea imbricata*); weak iodine for sores and cuts; "castor oil for intestinal disturbances and cod liver oil for marasmic children." After decades of attempts to treat Tokelau ringworm by sulphur fumigation, this treatment, in the hands of the Women's Committees, showed the first successes.

11. See Quain's description of the negotiations and hard bargaining which one Fijian father was engaged in to obtain milk from his Fiji-Indian neighbour (Quain, 1948). Parkinson (1991b) has noted the difficulty in preparing foods.

12. A typical annual budget for CWC for a year is shown in CP35/31.

13. The complicated system of sanitary authorities and districts is described in MD1930 and MD1933.

14. This programme does not appear to have been a success, as filariasis was found to be widely prevalent in a comprehensive survey carried out between 1945 and 1948 (Symes, 1960).

15. The proportion of homes with bored hole latrines cannot be established from either the published medical reports or the reports of the Director of the Western Pacific Health Service (WPHS) as these give numbers of latrines completed in a year without giving a clear indication of the base number of homes. But Lambert, the WPHS Director, writes in 1935 (CP26/36) in reference to the great improvement in soil sanitation as a result of the bored hold latrines, "Formerly most houses were without latrines. The standard has been raised from year to year and now one scarcely finds a house without one."

16. 2612 cases were reported in 1935; 3198 in 1936 (MD1936).

17. Suva was also the home of the great majority of Europeans living in Fiji. The population of the Greater Suva area in 1936 was 15,522; 8,394 living in Suva town. 3,471 of these were Fijians.

18. Dr. V.W.T. McGusty as Director of Medical Services attempted to address what was clearly becoming a sensitive issue in the Colony in a paper included in MD1938. The Council of Chiefs had asked the Government to establish a sanatorium and had offered to put up a considerable sum of money (£6,000) for this.

19. There is little available quantitative evidence on provincial rates of childhood mortality; the detailed provincial reports were not published after 1931. However, the Native Affairs Reports for 1937 and 1938 show that Lau and Kadavu had amongst the lowest IMRs as they had done in earlier periods.

20. The reader will recall from the previous chapter that there is a hiatus in the mortality statistics between 1915 and 1923. The limited statistical picture of childhood mortality is given in Tables III-6 and III-7. Also comparing the period 1914-1915 to 1927-1928 with that of the pre-WWII CWC gives periods of about the same length, which is important in comparing the proportional decline in rates. See note 24, Chapter III.

Here, as elsewhere in this analysis, "childhood mortality" refers to 5q0 and "child mortality" refers to 4q1.

21. It is possible and even likely that both direct and indirect estimates are to some degree underestimates due to underregistration and underreporting of dead children.

22. Neo-natal mortality rates for the period 15-19 years before the surveys analyzed by Rutstein (1983), show a range of NNMRs (o/oo) of between 18.5 (Syria) or 22.7 (Malaysia) and 94.4 (Bangladesh). The analysis for Fiji is wrong, placing it at 4. My own analysis of the FFS shows a NNMR of 28 in the 10-20 years before the survey. All of these WFS estimates are based on a period of about two decades later than the period which is analyzed in this chapter and some of the participating countries had benefitted from changes in medical technology.

23. In England and Wales, the decline in child mortality began in the early 1860s and within 40 years had declined by 60%. The sharp and continuous decline in infant mortality began in the first decade of the new century and declined by about 60% in the next 40 years (Wilson and Oeppen, 1994).

24. Stillbirths were not regularly reported in the Medical Department Reports after 1915. They are reported in the Native Affairs Reports for 1937-1938.

25. There is no record of the numbers of births in hospitals and dispensaries for the country as a whole. By the mid-1940s slightly less than 10% of births to Fijians were taking place at the Suva hospital alone. From the mid-1930s the beds allocated for maternity in the Suva hospital were fully used.

26. Native obstetric nurses were not the only medical professionals involved in obstetric care. Some of the DMOS and the NMPs attended births and the European child welfare nurses also attended many births.

27. A review of child welfare work in 1940 (MD1940) noted, "The framework of this campaign appears to be peculiarly well suited to the social system of the Fijians. [The voluntary women workers in the villages] receive strong support from the older and more influential chiefs, and the voluntary worker has now come to occupy an important place in native society, a fact which has, in turn, raised the status of the women generally." Along these same lines, it was seen as a positive start of the postnatal clinic at the Suva hospital that the wives of two "principal chiefs" were regular attenders (MD1927).

28. The ethnographic evidence on women's work from Kadavu (Katz, 1985) is from a much later period but the pattern of work is similar to that described for Lau from the earliest records.

29. The report, written by M.E. Bell and L. Wills, is entitled Report on Pilot Survey on State of Nutrition of Fijians and Indians in Fiji, January-February, 1950. It is Appendix IV of MD1950.

30. There is no evidence that the CWC's nutritional advice on other aspects of infant feeding were not heeded, e.g. more regular nursing, and the introduction of suitable pureed foods.

31. This is not to say that there were not clear examples of neglect; see Coulter (1942).

32. Quain's work was carried out in an isolated part of Bua. His observations, some of which are critical of the CWC and the NMPs, are useful in showing the differences in the work of the medical services even within a relatively small geographical area. Bua had consistently high mortality rates throughout the first decades of the 20th century and, as a consequence, received attention disproportionate to its size in this period. In Quain's period in Fiji (1935, publication was later because of his untimely death) there were "four or five [medical stations] in Bua Province". The leeward half of the province was served by a well-educated and experienced NMP who spoke English and French, "establishes quarantine in times of epidemic and inspects the water supplies of the villages of his region several times a year... he tries to enforce the sanitary law...he spreads valuable propaganda about aseptic first aid, infant feeding, and maternity care" (Quain, 1948).

33. The exact number of dispensaries is not clear from the medical reports. Some were extensions of the homes of the NMPs and these changed. Some hospitals saw predominantly Fiji-Indians. Medical reports of the late 1940s included maps with dispensaries and medical centres displayed. Later maps such as those used by Fisk (1970) give a good approximation, even for this period, of the location of Fijian villages in relation to Fiji-Indian settlements and the differential geographic concentration of the two ethnic groups. See Map 3.

34. Road development increased in the 1930s. The Suva-Sigatoka road was opened in the mid-1930s as were some other major roads (MD1935, 1936). The rapid spread of some diseases was attributed to these developments.

35. Many hospitals and medical stations had extensive gardens from which food could be gathered.

36. The risk of dying in the months following measles is greater than the risk of dying in the acute phase, with a case-fatality rate as high as 15% reported by Williams and Hull (1983) in the Gambia.

CHAPTER V
THE ROUTE TO LOW MORTALITY: 1940-1965

1. Introduction

1.1. Mortality decline

The rapid declines in mortality which occurred after World War II in many developing countries have been analysed within much the same framework as the declines in developed countries which occurred many decades before. These analyses have considered and weighted the contributions of social and economic change, especially rising standards of living, as compared to public health inputs, including new medical technologies (McKeown, 1976; Preston 1980; Palloni, 1990a). There has been far from universal agreement about the relative size of the effects of these factors on mortality trends generally or in specific countries or regions (see for example, Murray and Chen, 1993; Palloni, 1990a; and Preston, 1980). Analysts agree that after WWII changes in medical technology, vector control and other health inputs had significant effects on the mortality declines (Preston, 1975; Palloni, 1991; Caldwell, 1986). They differ in the weight of these factors in relation to social and economic development. And it is clear that there is no single pattern of decline in childhood mortality in developing countries (Palloni, 1990). Much of the analysis of post-war trends in developing countries is carried out only at the aggregate level (see especially Palloni and Preston cited above). While this has a certain analytic elegance, such analyses are far removed from the social and health context where children die. There is little attempt to "particularise" (Kunitz, 1990) their results.¹

The analysis in this chapter is of a different kind. Concentrating on a relatively short breakthrough period in the mortality decline, where the social and economic context can be relatively well specified, the major health initiatives and the disease environment in which they occur are examined. The object is to assess the effects of these different initiatives on the probable causes of deaths, to eliminate those which had small effects, and to evaluate the others.

McKeown's analysis of the British mortality decline has been called "Holmesian" by Szreter (1988) and others. The analysis here takes a similar eliminatory form. However, the concentration on a relatively short period of time permits interventions to be linked to changes in mortality rates within

a closely specified social context. This makes it less likely that one factor emerges as critical merely by default.

Williams and Galley (1995) have identified as an impediment to the development of explanations of the decline in mortality our heavy reliance on only quantifiable variables,

From the broad spectrum of factors affecting the life chances of infants, many cannot be quantified, and there is often an unwillingness to move beyond the security of hard statistics, graphs, and tables in search of qualitative, often patchy and invariably local material.

Such a move involves a commitment to more discursive, less easily operationalised and inevitably longer analyses, as is the case here.

1.2. The Caldwell analysis

One study of long-term mortality trends which has attempted to "particularize" mortality declines in the post-war period is Caldwell's much cited paper "Routes to Low Mortality in Poor Countries" (Caldwell, 1986). The questions that are asked in this chapter are to some degree shaped by this paper: "How is the breakthrough period in Fijian child mortality defined?"; "What are the main contributing factors to the period of relatively rapid decline?"; "Does the route to low mortality in Fiji conform to the conditions outlined by Caldwell for other countries?" As in previous chapters, however, we also ask what role the Government played in the mortality decline, a question virtually ignored by Caldwell.¹

Caldwell looked at four societies (Sri Lanka, Costa Rica, Kerala and China) which were the focus of a Rockefeller Foundation Conference in 1985 (Halstead et al., 1985). The four are countries which achieved particularly rapid declines in mortality in the context of limited economic development or growth. The paper examined, in considerably greater detail than the report, "how the selected populations [most of the paper deals with Sri Lanka, Kerala and Costa Rica] achieved such low mortality and whether their routes could be followed by other poor populations."² The analysis was extended beyond the countries examined in the Halstead report and asked "To what extent [the experiences in these countries and others not investigated in the report] are exceptional and [whether they] are balanced by countries with exceptionally bad experiences", experiences worse than would be predicted by their economic status. To this end countries were described as "superior" and

"poor" health achievers.⁴ The paper also introduced the concept of "breakthrough periods" in mortality decline -- "periods of exceptional advances against mortality."

The examination of superior and poor health achievers focussed on the **differences** between these groups of countries rather than the **common characteristics** of the superior health achievers, as was done in the Halstead Report. Caldwell's conclusions were to a large extent derived from the negative characteristics of the poor achievers -- the low status of women, the low levels of education, and the relatively low health inputs. The "superior health achievers" were: Sri Lanka, China, Burma, Jamaica, India, Zaire, Tanzania, Kenya, Costa Rica, Ghana; and Thailand, together with (separately) the Indian state of Kerala.⁵ The "poor health achievers" were: Oman, Saudi Arabia, Iran, Libya, Algeria, Iraq, Yemen, Morocco, Ivory Coast, Senegal, and Sierra Leone.⁶

Caldwell observed that "Nine of the eleven poor health achievers are wholly or largely Muslim, while the other two (Sierra Leone and the Ivory Coast) have large Muslim minorities." This fact shaped much of his further analysis of these countries and the detailed analysis of Sri Lanka, Kerala, and Costa Rica. On the other hand, the fact, which was also noted, that 8 of the 12 superior health achievers (8 of 11 if China is excepted) were formerly under British administration receives scant attention. Some of these countries/states (Sri Lanka and Kerala are good examples) had substantial health infrastructures in place after World War II which allowed them to take advantage of the post-war advances in medical technology and of developing international aid programmes.

Both the decline in mortality prior to breakthrough and the ability to exploit (and demand) new health inputs were, according to the Caldwell model, determined by characteristics of the societies of the high achievers which distinguish them from others. These include their relatively small sizes and the density of population settlement which facilitated health care delivery. However, three characteristics emerge as critically important: the favourable position of women and their relative autonomy, the demand for and achieved level of schooling, and political power at the grassroots. These, it was argued, create both a demand for efficient health services and their utilization.

Caldwell explained rapid mortality declines in the post-WWII period not in terms of health inputs (although he acknowledges their importance) nor government programmes (especially vertical programmes) but largely in terms of individual attributes. Educational inputs are described in terms of the individual's "demand for education" and political inputs as individual activism in the context of an egalitarian political system. He writes "...grass-roots activism and radicalism are key elements in making health systems work, probably more important than government radicalism in establishing programmes". It is change in the health-related behaviour of individuals, change from the "bottom-up" rather than the "top-down".

In the previous chapter we looked at the Child Welfare Campaign in Fiji in this light; it had at its heart the goal of changing the individual behaviour of parents, and we asked what the responses to these initiatives were. It is important, however, to recall that attempts to change the behaviour of Fijian parents were carefully set in the context of village based communal life. In the period 1940-1965 the focus of government health initiatives was less on changing the behaviour of the individual, although this too was advocated, than on using the power and resources of the state to enforce health. These programmes are described in Sections 3 and 4. As we shall see, health programmes in the post-war period were not the result of individual or populist demand, but were a product of interventionist government policies. Populist intervention only manifested itself, and then through the powerful Fijian leadership, in the resistance to attempts to "modernise" the health service by the creation of a few large health centres equipped with modern technology. The service retained its character as one which combined decentralised health centres with village-based health care delivery. This was an ideal environment for the new government programmes of the 1950s.

2. The Breakthrough in Child Mortality in Fiji.

"Breakthrough" is a somewhat weak but useful concept. It is defined almost solely by an unprecedentedly fast decline in mortality rates in a population. Breakthrough periods have begun in different time periods in different countries and in the context of different levels and kinds of health infrastructure and different medical technologies. Thus in Sri Lanka the Caldwell-defined breakthrough begins in 1946, in Kerala in 1956

and in Costa Rica 1970 (see Table V-1).

Table V-1

Gains in Life Expectancy over the Breakthrough Periods:
Sri Lanka, Kerala, Costa Rica and Fiji.

	Sri Lanka	Kerala	Costa Rica	Fiji
Breakthrough	1946-53	1956-71	1970-80	1953-65
Initial Life Expectancy*	46	49	66	55
Final Life Expectancy*	58	61	73	65
Average Annual Change	1.71	0.80	0.70	0.83

* Life expectancy at birth.

Source: Caldwell (1986) for Sri Lanka, Kerala, and Costa Rica.

In Kerala and Costa Rica it can be argued, and in relation to Kerala was argued by Caldwell, that "the Kerala experience was little more than a somewhat faster episode in a long period of continuing change". A breakthrough period in achieving exceptional mortality declines does not imply a breakthrough in all components of mortality and, indeed, in Sri Lanka and Costa Rica the gains were particularly great for child mortality, and the health inputs appear to have been largely directed toward this target. The breakthrough concept suggests some end point by which **relatively** low mortality, by present-day standards, will have been reached, since all of these countries had seen great declines in mortality over time, albeit at a slower pace. For Fiji, the most important "breakthrough" (with the exception of one or two provinces), measured by pace and the IMR point decline, (i.e. the number of mortality points, where a decline from 200 to 100 is 100 points) was between about 1898 and 1915. However, "breakthrough" as used by Caldwell does not suggest a **single** low-moderate level that helps to define the period. Expectation of life at birth at the end of breakthrough is 58 for Sri Lanka at the end of the breakthrough period and 73 for Costa Rica. The Fijian period of breakthrough to relatively low mortality, defined below, begins about where Sri Lanka's ends.

The utility of the breakthrough concept is in forcing the analyst to look for periods of very rapid decline in mortality, the brevity of which will allow the number of factors that are

changing to be controlled. As Caldwell explains it,

The importance of the breakthrough periods in Sri Lanka and Costa Rica (and to a much lesser extent in Kerala) is that they were sufficiently brief to permit little fundamental social change during the period; these are laboratory conditions during which rapid mortality decline, though doubtless conditioned by the existing nature of the society, must be explained by new and different inputs. It is probable, of course, that the same inputs played a significant, but not so dominant, role in the longer mortality decline.

In theory the **beginning** of a breakthrough period might be defined by new health inputs, the results of which might be lagged, rather than the point in the curve when mortality shows a substantial and sustained decline without regard to specific changes in the medical and social context. Here, consistently with Caldwell, the breakthrough period is defined as the point in the mortality curve which shows a change in pace in the mortality decline and a decline which is largely sustained.

The precise dating of the Fijian breakthrough presents some problems compensated by some analytic opportunities. The problems stem from worsening vital registration (VR). But here it is possible to use indirect estimates of mortality as well as vital registration to establish the timing and magnitude of the breakthrough. We can use the indirect estimates to define the broad breakthrough period and the levels of mortality in this period and vital registration to specify more precisely the start and the end. For this latter, indirect estimates are less useful as they are based on retrospective accounts which are averages of past mortality regimes. The exact time location of the indirect estimate depends on how closely the assumptions of the method are met. A central assumption is that mortality declines linearly. A breakthrough period is by definition a discontinuity in the linear decline. For this reason the estimates of time location may be imprecise.⁷ Thus, the indirect estimates are likely to be less reliable for single-year estimates, which are necessary in establishing discontinuities in rates, than is vital registration. This is so even if deaths are underregistered, as long as they are consistently underregistered.

That indirect estimates are necessary to estimate the magnitude of the breakthrough can be seen from a comparison of direct and indirect estimates of infant mortality rates, the child health indicator most used by the Government (see Figure V-1).⁸

Figure V-1 Infant Mortality 1946-1976
Direct and Indirect Estimates, (CEB/CS),
1956,66,76 Censuses, Trussell, North

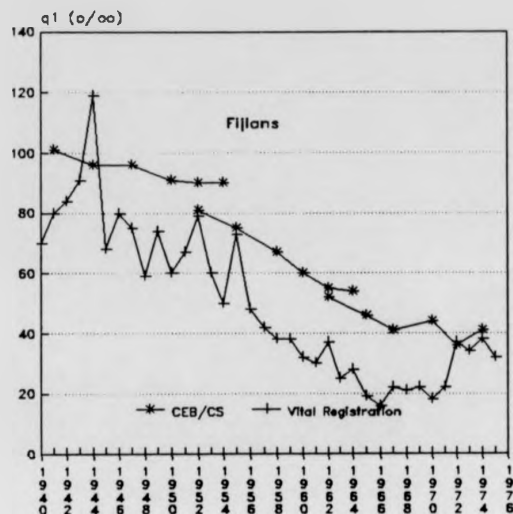
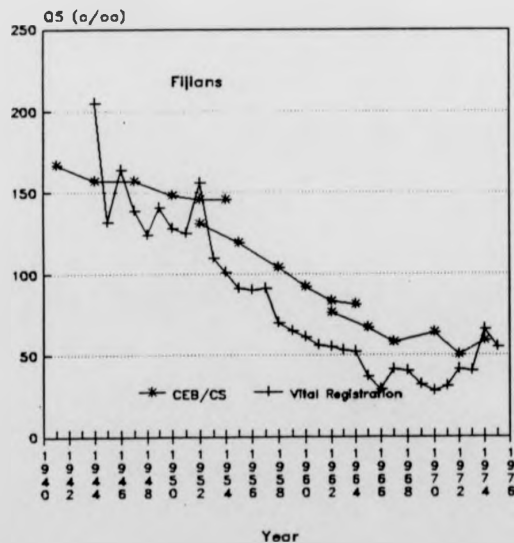


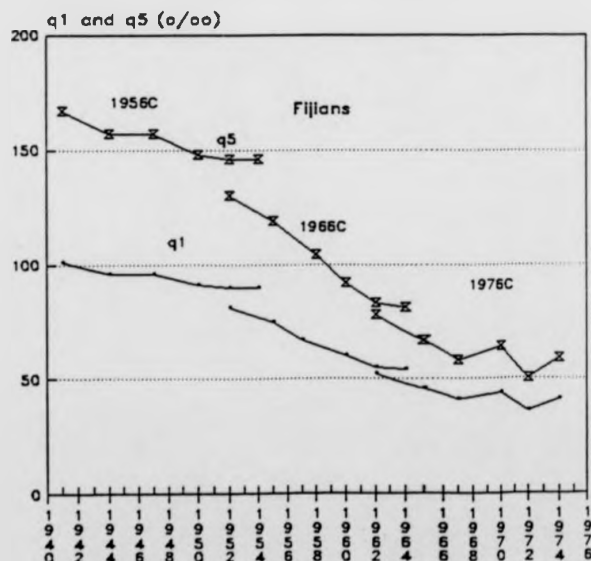
Figure V-2 Childhood Mortality 1946-1976
Direct and Indirect Estimates (CEB/CS).
1956,66,76 Censuses, Trussell, North



Only in the two epidemic years of 1952 and 1955 do the direct estimates approximate the indirect estimates until the early 1970s when a new system of registration is introduced. Estimates of q_5 are shown in Figure V-2. The same graphs of moving averages (not shown) suggest that vital registration is somewhat worse in the 1960s than in the 1940s and 1950s.'

Figures V-1 and V-2 show mortality estimates which cover the period from 1940 to the mid-1970s. Both indirect and direct estimates show a change of pace in the mortality decline beginning in the mid-1950s. Although there is some apparent decline in mortality in the 1940s it is very modest. Looking more closely at indirect estimates, as vital registration is worsening to some degree in this period, Figure V-3 shows a dramatic decline in mortality based on the estimates from the 1956 census and the 1966 census.

Figure V-3
Childhood Mortality 1946-1976
Indirect Estimates (CEB/CS)
1956, 66, 76 Censuses, Trussell, North



While a change of pace is therefore evident, it is more difficult to establish the beginning and the end of the breakthrough. For this a detailed picture of the variation in annual rates derived from VR is needed. Figure V-6, which is analysed for other purposes in Section 6, shows a sharp decline in the CMR between 1952 (24) and 1953 (13). This decline was largely sustained except for the measles epidemic year of 1957. There was a significant decline in the IMR between 1953 (60) and 1954 (50) following a whooping cough epidemic in 1952 (79), with 1953 also showing a decline from the rate in 1951 (68). Except for another peak in 1955 (73), probably the result of whooping cough, and a smaller peak in 1962 this decline was also sustained. Therefore 1953 is a reasonable estimate for the beginning of the breakthrough period.

The level is set by the indirect estimates. For many of the years for which there are indirect estimates of mortality there are two estimates, as the figures show. One is based on women of younger ages in the most recent census relative to the year for which the estimate is made; the other is based on older women in a later census. Estimates based on women 20-24 may be too high as discussed in Section 4.2.3 of chapter II. Estimates based on data from older women may be too low if some child deaths are omitted. Complicating this is the fact that the censuses improve over time; other things being equal an estimate from a later census may be preferable to an earlier one. The strategy that is used here to estimate q5 for a given year is to average the two estimates. This perhaps gives undue weight to the later estimate but it is from a better census.

Estimates of q5 for about 1953 can be derived from the 1956 and 1966 censuses. The estimates for 1952 based on women 20-24 and for 1954 based on women 25-29 are both 146. The estimate for the same period based on women 45-49 in the 1966 census is 131. Averaging the two estimates gives 138, which is used here.

The end of the breakthrough period is estimated at 1965. The CMR declined significantly from 6.6 to 3.4 between 1964 and 1965, a level which was sustained except for the measles epidemic in 1967 which continued into 1968. The IMR declined from 27.9 to 19.2 and the rate of change appears to slow after this. This slowing of the rate of change in the rates is also shown in the indirect estimates derived from the 1976 census (Figure V-3).

Again the level is set by the indirect estimates. The 1966

census gives an estimate for 1964 of 81, based on women 20-24. The 1976 census gives an estimate for 1965 of 67, based on women 40-45. Averaging these gives an estimated level of 74 for q5.

Having established these estimates, they can then be used to measure the rate of decline in the pre-breakthrough and post-breakthrough periods as shown in Table V-2.¹⁰

Table V-2
Breakthrough Period Defined*

Period	No. Years	Estimated Decline in q5	Point Decline	% Decline	Average Annual Point Decline	Average Annual % Decline
1941-1953 Pre-Breakthrough	12	178-138	40	22	3.3	1.8
1953-1965 Breakthrough	12	138-74	64	46	5.3	3.8
1965-1975 Post Breakthrough	10	74-55	19	26	1.9	2.6

* See text for discussion of the derivation of these estimates, and see Appendix B.

The level of mortality at the beginning of the pre-breakthrough period, defined rather arbitrarily as 1941, can be estimated from the 1946 and the 1956 censuses, which give somewhat different results. Based on women aged 25-29 in the 1946 census the estimate is 188. Based on women aged 45-49 in the 1956 census the estimate is 167. Again, these are averaged giving an estimate of 178.

The post-breakthrough period is defined as ending in 1975. This gives a period of about equal length to the breakthrough period and 1975 is a year for which there are good indirect and direct estimates of q5.¹¹

As this table shows, the breakthrough period was a period of exceptional decline in levels of mortality, as measured by q5. The average annual **point** decline in q5 is 5.3 in the breakthrough period as compared to 3.3 in the pre-breakthrough period. Childhood mortality (q5) declined in this period by almost half, from 138 to 74.

The age pattern of mortality, as measured by the percentage of registered deaths under 5 which occurred to children between 1 and 5, changed very little between the end of WWII and the early 1970s. This percentage was 46% in the years 1943-1952, the pre-breakthrough period; 40% during the breakthrough period and 42% between 1966-1972. (1972 was the last year before the new vital registration system was in place.) This stability in the

age pattern is somewhat surprising given the usual expectation that levels of child mortality will decline before infant mortality. However, amongst Fijians neonatal mortality was relatively low, breastfeeding remained high, birth intervals were relatively long as evidenced in the Fiji Fertility Survey, and a very large proportion of births were medically attended. These are all factors which would enhance the survival chances of infants. On the other hand the weaning diet remained a poor one, increasing the vulnerability of children after the first year of life. The age pattern of mortality does change in the late 1970s and early 1980s when child deaths are about 30% of deaths under 5.¹²

The next section briefly characterizes the health services and CWW in the pre-breakthrough period, including the war years. Section 4 describes the breakthrough period itself.

3. Health Services and Child Welfare: Pre-breakthrough.

3.1. The war years

At the outbreak of World War II the Colony had long-standing approval from London for the expansion of public health programmes and hospital services (MD1942). The war brought this expansion to a standstill. Several European doctors were moved into public health work in urban areas in response to a rapid increase in the urban population (MD1943). The NMPs were stretched to take on work that had been covered by European medical staff (MD1941) and some were moved from the field to take up responsibilities in relation to the call-up and care of Fijian soldiers. There was an acknowledged shortage of medical workers to care for civilians even though there were more Western trained doctors in Fiji than ever before in its history. Some medicines were in short supply; importantly there was a shortage of arsenical preparations used in the treatment of yaws (MD1942). But hospitals and dispensaries remained open and urban public health services were developed (MD1943-1944).

The war was disruptive to life in Fiji both because of the large proportion of Fijian men involved in the war effort and the large numbers of foreign troops stationed around Suva and Nadi. However, this sudden concentration of new residents involved a corresponding concentration of public health resources in these two urban areas. Suva, which already had the Colony's best water supply and sanitary services, had these services developed still further (MD1941, 1942). There was a severe shortage of housing in urban areas which was, in part, resolved by requisitioning Fijian

and Indian houses (MD1941, 1942; Lal, 1992). Most building during these years was given over to military needs.

Over 11,000 men from Fiji served in the military. At any one time about 80% were Fijians. In the peak month of August 1943, 6,371 Fijians were in military service (Howlett, 1948). Assuming that most men were between the ages of 18 and 35, this amounted to 43% of the age group.¹³ Many other young men and women moved to the towns to seek employment, and Fijian villages suffered as a consequence. Village sanitation deteriorated in the war years and communal obligations were ignored (MD1943; Lal, 1992). Despite these burdens on village life, food was in abundance as those encouraged to produce more food responded enthusiastically (MD1941; Lal, 1992).

Child Welfare Work (CWW) carried on much as before the war but with less participation and supervision by European medical staff. Indeed, throughout most of the war years there was no European Child Welfare nurse anywhere in the main island of Vanua Levu. However, while the war caused difficulties in the running of many public services, the 1942 Medical Report noted that "owing to the keenness of the natives, the work [child welfare] was carried on at a reasonably satisfactory level in the country districts, while in Suva it made admirable progress..." The Women's Committees continued to play an active role in CWW and it was reported in 1943:

The village committees are grouped under a Fijian Welfare Nurse, who is required to keep in close touch with her groups by constantly visiting them (MD1943).

The Medical Report for 1945 notes:

The Fijian Women's Committees have given, and have been given, great help throughout the year... the co-operation of the people in the efforts made to secure the good health of the mothers and children has been excellent.

In recognition of the importance of the native obstetric nurses to CWW, and increased demand for their services, the number in training was doubled in 1940.

Despite the continued support for CWW, vital registration had deteriorated -- a sign perhaps that these rates were no longer of the great interest that they had once been. It is surprising given past interest in the quality of reporting of births and deaths that the Medical Reports of this and the post-war periods fail to regularly acknowledge or assess this underreporting in evaluating the mortality rates. Indeed, the 1944 Medical Report records that "Figures for infant mortality

of probably sufficient accuracy to allow valid comparisons, are now available over some 20 years."¹⁴ It is also surprising to find in the reports of the early 1940s that relatively high Fijian childhood mortality was to some extent expected -- perhaps a sign of some resignation after the relative failure of the campaigns of the 1930s. The 1943 Medical Report observed,

It has also to be remembered that the present Fijian infantile death rate compares favourably with that of similar peoples with comparable living conditions in other parts of the world, and ... that in all of the attendant circumstances a rate of under 100 can be regarded as relatively satisfactory.

Credit for the lower childhood mortality rates between 1940 and 1943 was given to the CWC, but these years were particularly healthy ones, and free from epidemic diseases. There is no evidence in this period, in contrast to the late 1940s and 1950s, of changes in medical technology and the benefits of larger numbers of district nurses were yet to be felt. A whooping cough epidemic in 1944 resulted in a sharp increase in reported Fijian infant mortality and brought the usual expression of concern on the part of the Government to the Council of Chiefs (CP10/45).¹⁵ In his 1945 speech to the Council, the Governor returns to a familiar theme:

I am concerned to hear that there continue to be large numbers of deaths of children up to the age of five... Rokos under the [recently established] native administration will be required to report to the Secretary for Fijian Affairs at the end of their first year of office on what they have done during the year to safeguard the lives of the younger generation. The Fijian population must increase more rapidly than it does if you are to prosper.

3.2. Post-war reorganisation of government and health services.

In 1944, a new and powerful Fijian Affairs Board was created, with Ratu Lala Sukuna in the chair as Secretary of Fijian Affairs.¹⁶ It replaced the Native Regulations Board, consolidating the powers of the Fijian "government within a government". Lal (1992) has described its functions as follows:

It made regulations regarding the welfare of the Fijian people and the observance of customary rights, ceremonies, obligations, conduct, and communal services; defined the powers and procedures and jurisdiction of Fijian courts in civil and criminal matters; and appointed district and provincial officials... It was also given the first right of review over any legislation that affected 'in any important matter the rights and interests of the Fijian people'...

The number of provinces was reduced from 19 to the present 14¹⁷, and larger units were formed at the sub-provincial level by combining villages and districts. The **Rokos** and **Bulis**, who were in charge of these larger units, could no longer have devoted the attention to child welfare and public health that they had done in earlier periods. This may, in part, explain the deterioration in vital registration, as discussed above in Chapter II. Tensions were to develop between this arm of Fijian government and the Medical Department, as described below.

Anticipating the post-war reorganisation of the health services, two reports were commissioned which were to help frame post-war health policy: the Watt-Lambie Report of 1943 (CP3/44) and the Buchanan Report of 1945 (CP30/46). Both reports gave particular attention to maternal and child health. Perhaps the most controversial proposal in the earlier report was the downgrading of the provincial hospitals basically to dispensaries. Resources saved were to be concentrated on the CWM and the larger regional hospitals. The provincial hospitals had been an essential part of the decentralised approach to health care that had hitherto characterised the Colony's health policy, and strong opposition to their closure was expressed by Ratu Sukuna and the Fijian Affairs Board. He wrote:

Provincial Hospitals...were designed to provide medical care solely for natives and were so placed as to be easily accessible to the greatest number of communities. Their early history was one of struggle against superstition, against the unwillingness of the sick to leave their homes, against the dread of death among strangers -- and in a strange land. Europeans with the world at their feet cannot imagine the poignancy of this feeling...It is thus not surprising that the native mind took a long time to accustom itself to these novel institutions, their strange methods of treatment and their tiresome prohibitions. For some years now Provincial Hospitals have, however, been well patronised, a sure sign of growing belief in the efficacy of the work they do. Doubtless the long years of medical inspections in backward districts and the more recent Child Welfare campaign in villages have materially helped to foster this refreshing attitude. It is now proposed drastically to curtail the activities of these hospitals and to concentrate patients in regional centres....It may not be realised that very few sick Fijians will readily leave home for a distant hospital, or be willingly allowed to do so by his relatives, unless accompanied by someone to attend to wants both on the way and in hospital and, in case of death, to arrange for a burial in keeping with status. (Scarr, 1982)

In the event, these views prevailed, and the provincial hospitals remained well-used health centres throughout the "breakthrough period".

The continued decentralisation of the health service undoubtedly played an important part in its ability to exploit post-World War II developments in medical technology, and remained a feature of the post-war reorganisation which took place on lines recommended by the Buchanan Report of 1945 (CP30/46). The reorganisation took place over several years. Four medical districts were created, each supervised by a District Medical Officer, with a district hospital offering a full range of medical and surgical services.¹⁸ There were also 14 provincial hospitals, now called rural hospitals, and 35 dispensaries.¹⁹ A tuberculosis hospital which opened in 1946 (Tamavua, Suva) became the third specialist hospital in the Colony, the other two treating leprosy and mental illnesses. In addition there were four small private hospitals, subsidized by the Government.²⁰

Attempts were made to speed the process of notification of and response to infectious diseases (MD1949). From each hospital and dispensary monthly morbidity returns were to be sent to Administrative Headquarters for any necessary action. In addition to these monthly returns, each medical officer in charge of a district was to submit a telegraphic return of infectious diseases which had occurred in his district. This information was to be referred to the Medical Department staff and immediate action taken to investigate the conditions under which diseases had occurred and to prevent their spread.

Maternity and child welfare services were also reorganised. Child and maternal health services became available to all races; "stationary clinics" and nursing stations were established throughout the country (including for the first time the major towns of Suva and Lautoka), increasingly combining child welfare work with antenatal, postnatal and obstetric services; public health nursing was restructured and job titles rationalised.²¹ Maternity and child welfare work became a central part of the overall health services provided by the Medical Department, with a report on these services included in each annual report; although reporting was very considerably better for Suva and larger hospitals. Inspection of schools and the examination and immunisation of school children were also incorporated into the

work of the Medical Department.

While the 1945 medical report criticized the lack of integration of various aspects of child welfare work throughout the health service, the 1949 report reflected the reorganisation and improvement, and underlined the Department's commitment to child welfare work at all levels of the service. It asserted that, "It is the policy of the Medical Department to stress the importance of district child welfare work through the DMOs, Health Sisters, AMPs and District Nurses."

The most significant change in the health services and the Child Welfare Work, however, was their extension to the whole population. Larger hospitals had served all ethnic groups by the mid-1930s and were heavily used by Fiji-Indians. In the 1940s, all health services were made available to all ethnic groups as a matter of principle and policy.

The number of locally trained medical practitioners increased modestly during the 1940s; the number of AMPs increased from 76 in 1941 to 86 in 1950.²² There was a great increase in the number of locally trained nurses, despite the curtailment of many health programmes during the war. By 1945 there were 163 native nurses and 105 in training (MD1945). The number of district nurses, whose primary role was to provide maternal and child welfare in rural areas, increased from 67 in 1946 to 100 in 1950.

The continuation of a decentralised and largely rural health service favoured the Fijian population whose villages were widely scattered throughout the Colony. Maps 3 and 4 show the distribution of both populations; the location of the hospitals and dispensaries is shown on Maps 3 and 1.²³

3.3. Conclusion

By the early 1950s, the beginning of the breakthrough period, the medical services in Fiji were in a strong position to take advantage of the new medical technologies of the post-war period, some of which were already in use in the campaigns against particular diseases which began in the late 1940s and are discussed in Section 4. There was a firm commitment on the part of the Medical Department to what was by this time known as "Maternal and Child Health", although without the fervour of the CWC in the 1930s. In its place was the integration of these services into the everyday preventive and curative services of the Medical Department, while preserving their decentralised

character. The promotion of Maternal and Child Health had become the norm.

Table V-3

Health Professionals and Health Centres at "Breakthrough"
Per 1000 Total Population

	Fiji (1950)*		Sri Lanka (1945-1946)		Kerala (1956)
Fully Qualified Doctors	.099	.392	.057	.124	.042**
Locally Qualified Medical Practitioners	.293		.067		
Nurses **	1,168		.254		.098
District Nurses *** (per 1000 Fijian pop.)	.340 (.770)		.079		N/A
Hospitals and Dispensaries. (Dispensaries per 1000 Fijian pop.)	.225 (.316)		.152		N/A
Hospital Beds	3,761****		2,998		N/A

* Registrar-General's Estimated Population, 31 December 1950.

(Total population: 293,764. Fijian population: 129,896)

** All nurses, fully and locally qualified, including district nurses in Fiji; Public Health midwives in Sri Lanka; and midwives/ANMS in Kerala. Doctors' qualifications not reported in Kerala.

*** District nurses in Fiji; Public Health midwives in Sri Lanka.

**** Based on 1105 beds in District and Rural Hospitals, including 256 at the Tamavua Tuberculosis Hospital. Excluded are 35 beds in the subsidised hospitals and an unknown number at the larger dispensaries.

Sources: Fiji, Medical Department Report 1950; Sri Lanka, Fernando, 1985; Kerala, Panikar, 1985.

Table V-3 shows several aspects of the per capita medical provision in Fiji in relation to Kerala and Sri Lanka at the beginning of their breakthrough periods. Fiji was in this respect considerably better placed for a breakthrough in mortality than either of these other populations.

4. Public Health Programmes and Campaigns: 1950 to the late 1960s.

4.1. Introduction

The "breakthrough" period is defined here as 1953 to 1965. However, in assessing the contribution of various factors to the breakthrough we need to look at a slightly broader time frame --

1950 to the late 1960s. In this way the level of health services, other social and economic factors, and the disease environment immediately prior to breakthrough can be analysed in relation to the breakthrough. The early 1950s was a period of intense public health activity, but the evidence does not suggest that the effects of the new and continuing programmes were felt before 1953.

The following are reviewed: Section 4.2 Health Care Provision; 4.3 Child Welfare Work; 4.4 Obstetric and Antenatal Care; 4.5 Sanitation; 4.6 Nutrition; 4.7 Disease-related Programmes and Campaigns.²⁴

4.2. Health care provision.

The period 1950-1966 saw a dramatic increase in the population. The total population increased by 62.8%, the Fijian population by 56.1%, and the Fiji-Indian population by 74.7%. The number of hospitals did not increase in this period²⁵, though the number of health centres and dispensaries increased from 36 in 1944 to 43 in 1966. There was, however, a significant increase in points of access to health services as nursing stations were set up in rural areas. The numbers were not reported annually. By 1964 there were 123 stations, but more than half of these were combined with urban clinics, dispensaries or rural hospitals (MD1964). The first of several planned "maternity units" opened in Nausori in 1966, taking some of the pressure off the CWM Hospital. Maternity beds were increased throughout the period.

Although the number of doctors increased over the period, the number per total population decreased (Table V-4).

Table V-4
Medical Staff (establishment), 1950-66

	1950	1956	1960	1966
Fully qualified doctors	30 (.102)	31 (.090)	30 (.075)	42 (.088)
Locally qualified medical practitioners	86 (.293)	116 (.336)	131 (.327)	131 (.275)
All nurses (fully and locally qualified)	372 (1.266)	486 (1.406)	509 (1.269)	652 (1.368)
District nurses	100 (.770)*	135 (.911)*	109 (.651)*	120** (.989)*

() Rates per 1000 total population

() * Rates per 1000 Fijian population

** After 1963, when there were 155, district nurse numbers were no longer reported separately from other nurses. There were 120 nursing stations in 1966.

The now long training of Assistant Medical Practitioners, the small medical school and the fact that the school also trained AMPs for other parts of the Western Pacific limited the growth in numbers. Recruitment, partly as a result of low salaries but also as a result of decreases in intake to the medical school, was difficult in some years and local doctors were called out of retirement (MD1965 and 1966). Additionally a policy of "localisation" meant that locally trained doctors were moving into the senior positions in the health service (MD1969) taking the place of European doctors.²⁶ While the number of nurses increased from 372 to 652, this increase just kept pace with the population increase (Table V-4). The number of nurses actually in post in any one year is impossible to assess as the reports in some cases include all established posts, some of which were not filled. Again the policy of localisation meant that senior nursing staff were moving into the senior roles previously filled by European nurses (MD1969).²⁷

One measure of health provision in this period is the number of outpatient attendances. However, numbers fluctuated from year to year, partly as a result of specific campaigns which were widely publicised, and also as a result of epidemics.

Table V-5
Fijian Outpatients (all hospitals and dispensaries), 1947-66

	1947	1950	1955	1960	1966
CWM Hospital	23716 (202)	28101 (216)	6114 (41)	50329 (301)	64014 (317)
District Hospitals	8089 (69)	11789 (91)	21128 (143)	29238 (175)	36733 (182)
Rural Hospitals	47600 (405)	62874 (484)	54345 (367)	64029 (382)	57450 (284)
Rural Dispensaries	84149 (716)	107601 (828)	127651 (862)	183761 (1097)	143100 (708)
Total	164867 (1403)	212436 (1635)	210696 (1422)	327357 (1955)	304175 (1505)

() Rate per 1000 Fijian Population.

Table V-5 shows the Fijian outpatient attendances per Fijian population. These stayed roughly the same over the period;

the apparent increase in 1960 may have been due to the BCG campaign. Hospital admissions went from 61.1 to 66.7 per 1000 total population between 1950 and 1967, while the number of beds declined from 3.8 to 3.2.

4.3. Child welfare work

Child Welfare Work continued to be the responsibility of all medical practitioners, with the main responsibility lying with the Health Sisters and nurses in the Child Welfare clinics and the District Nurses in rural areas. Between 1940 and 1950 the number of Health Sisters and District Nurses, whose work was primarily devoted to maternal and child health, increased from 6 Health Sisters and 12 locally trained nurses to 9 and 100. In 1963 these numbered 12 and 155 respectively. The exact numbers varied from year to year as some nurses in rural areas were deputed for other duties. For example, the 1958 polio epidemic brought nurses from the districts to the hospitals (MD1958). In 1961, 1962, 1963 the numbers of District Nurses were 118, 126 and 155; this increase probably reflected preparation for the immunisation campaign belatedly started in 1963.²⁸

By the early 1960s nursing stations were established throughout the country. The work of these is best described in the 1964 Medical Report. The 123 nursing stations were

staffed by locally trained nurses whose work is largely in the field of maternity and child welfare. Each travels from village to village holding antenatal and Infant Welfare clinics as well as providing a Domiciliary Midwifery Service in her area... Each district nurse has a number of villages for which she is responsible, and the nurse/population ratio varies from approximately 1:1200 in the Eastern Division where communications are difficult to 1:3200 in the Western and Central Divisions where communications are much more easy. The Colony-wide figure is 1:2623. There are twelve Health Sisters situated at Divisional Offices and other strategic points throughout the Colony who are professionally responsible for the district nurses' work.

Detailed reporting of the work of these nurses is poor, although for some years medical reports include a table which shows clinic attendances, rural visits, numbers and types of inoculations given and, for a few years, types of conditions seen. But these reports do not typically give the age and ethnic group or geographical catchment of these contacts, nor is it clear whether the unit of analysis is a "visit", a "person" (which might mean the first of several visits for one condition), or "conditions", where an entry for several conditions might be

made for one person. It is assumed in the analysis which follows that the numbers refer to a visit or contact. Because of these reporting deficiencies neither the rates of visits by age nor the proportion of children who have seen a nurse at some time in a year can easily be calculated.

An estimate of the nurse/child contacts in this period can be derived from the 1961 Medical Report. In this year 63,585 pre-school "persons" were seen by Health Sisters and 250,104 by District Nurses. This figure combines urban and rural contacts and is based on provincial numbers. This gives an estimated 4.3 contacts per child under 5 years.²⁹ This estimate is likely to include such a minimal contact as an injection (a DPT series would mean three contacts) as measured by a "person" seen, so these numbers do not represent the quality of the contact. However, any contact would allow a nurse to note whether a child was seriously ill.

The number of District Nurses, those whose work was primarily concerned with maternal and child health, increased by half over the breakthrough period and the work remained a priority of the health service as a whole. However, in terms of public health provision the 1969 Medical Report observed that the work of many of the nurses "largely filled the gap left by the elevation of the old AMP into the doctor of today." Nonetheless, the substantial numbers of health professionals whose work was devoted to maternal and child health at the **beginning** of the breakthrough period meant that any new medical programme could be quickly delivered, especially to the rural population. That this was the case is probably as important as the new technology itself.

4.4. Obstetric and antenatal care

The number of births in hospital or attended by District Nurses is not reported annually during this period, except for those at the CWM Hospital. Table V-6 shows the dramatic increase in the proportion of all Fijian births which took place at this single hospital -- 4% in 1946 to 16% in 1966. In 1966 29% of Fijian births took place in one of three divisional hospitals. By 1964 62% of all births, i.e. births in all ethnic groups, took place in hospital or were attended by a District Nurse. This is probably a reasonable estimate of the proportion of Fijian births medically attended throughout the breakthrough period. And it is probably a considerable increase over medically attended

deliveries in the previous decades as the number of nurses working in the districts had greatly increased. In the 1930s and 1940s, however, the trained members of the Women's Committees would have attended an unknown but substantial number of births.

Table V-6

Births and antenatal visits, CWM Hospital: Fijians, 1946-1966

Year	Total births	Births at CWM	Antenatal First visits	Antenatal Repeat visits	Antenatal Total visits
1946	4644	205	262		846*
1956	5378	534	785	2803	3588
1961	6362	888	1012	5377	6389
1966	7318	1144	1121	5379	6500

* Not reported for 1946. 846=1947 Fijian antenatal total visits

CWM, Lautoka and Labasa Hospitals					
1966	7318	2123	2205	9069	11274

The pressure for deliveries in hospital was keenly felt over the whole period. But it was not until 1966 that the first of the new maternity hospitals was opened. By 1966, 78% percent of all births were medically attended and by 1970, 88%.

Table V-6 shows the number of antenatal first visits at the CWM and for 1966 at the other larger hospitals. The antenatal visits at CWM increased throughout the 1950s and early 1960s. The 1967 Medical Report records that the "average time for the first visit was between the 22nd and the 25th week ... this is earlier than was the custom only a few years ago when women attended only for the last trimester, if at all..." There is no consistent reporting of antenatal visits in rural areas. However, in these areas it was a primary responsibility of the District Nurse to know who was pregnant and make regular visits (MD1969).

While the increase in hospital deliveries undoubtedly contributed to the decline in Fijian infant mortality rates, the contribution is likely to have been less than it would prove to be in other developing country populations, including the Fiji-Indians. Table V-7 shows the neonatal mortality rates of the two groups during a period when CWM attempted to restrict obstetric

patients to high risk groups only.³⁰ These in-hospital rates will largely reflect deaths in the first few days or first week of life as deaths later in the first month may well have occurred outside the hospital or away from Suva. (Perinatal mortality rates were not kept at CWM until the 1970s). The NNMR for Fijians was 34 o/oo, that for Fiji-Indians 64. Numbers of premature births were 54% greater for Fiji-Indians than for Fijians. Fijian stillbirths were half those of Fiji-Indians. Fiji-Indians also showed higher rates of anaemia, pre-eclamptic toxemia and eclampsia than did Fijians. The contribution to the mortality decline of births occurring in hospital, rather than at home, will depend on the risk factors around the time of birth found in each population. This evidence suggests that it was considerably more important for Fiji-Indians than for Fijians. Later research shows the significantly greater proportion of low birth weight babies amongst Fiji-Indians. Relatively low neonatal mortality rates amongst Fijians were seen in the previous decades well before any significant number of hospital deliveries (see chapter IV).

Table V-7
Selected Characteristics of Pregnancy and Birth, 1959-61

A		
	Fijians 0/00*	Fiji-Indians 0/00*
Neonatal Mortality	34.0	63.8
B		
	Fijians 0/0**	Fiji-Indians 0/0**
Premature Births	38.6	60.1
Multiple Births	20.0	11.6
Stillbirths	19.2	39.4
Anaemia ***	240.6	582.1
Pre-eclamptic toxaemia	24.0	50.8
Eclampsia	0	0.43

* Base = All Births.

** Live births, except for stillbirths which are % of all births

*** 1960-61 only.

Source: CWM Hospital Obstetric Ward Records, 1959-61.

4.5. Sanitation

Village sanitation, as reflected in the Medical Reports, appears to have deteriorated in the war years and after, although reports may also reflect changing standards of what were acceptable levels of sanitation. In contrast to earlier periods in Fiji's public health history, sanitation in Fijian villages received little attention from the Medical Department or other parts of the Government during the 1940s and 1950s. In part this was due to the Medical Department's lack of access and authority in the villages. The administration of health regulations remained divided in the country as a whole. The Public Health Ordinance applied to areas outside Fijian villages and was administered by a Central Board of Health and local authorities. The health regulations of rural Fijians were incorporated in the Native (later Fijian Affairs) Regulations administered by the Fijian Affairs Board with penalties set by Fijian courts. The Medical Department's Health Inspectors could not enter villages, although Medical Officers could. This cumbersome and unsatisfactory arrangement continued throughout the breakthrough period.

The lack of a clear definition of responsibility for sanitary inspections exacerbated the problem. In the 1940s and 1950s the District Health nurses were responsible for "field inspections" (MD1950) adding the evaluation of sanitation to their many other roles, while the AMPs were assuming the roles of doctors rather than sanitary inspectors as they had been in previous periods.

From 1957 onwards Medical Department reports expressed annual and mounting concern with the state of the villages and the attitudes of the villagers. The report for 1958 recorded that "standards of village hygiene in many areas are appallingly low, and the people must co-operate in their improvement". The 1960 Report opened with descriptive language reminiscent of the 1920s:

In many villages, latrines, if they exist at all, are badly maintained or unused, refuse disposal is ill-organized and water supplies are open to gross contamination. This state of affairs cannot be excused by lack of funds as adequate sanitation could be achieved with material and labour already to hand, but is due to ignorance or indolence.

Similar sentiments were expressed in each of the next three years.

This renewed concern was explicitly linked to the observed increase in the incidence of intestinal diseases, and Infantile Diarrhoea (ID) in particular, ascribed in 1957 and subsequent years to poor environmental sanitation, especially in rural areas. By the late 1950s, with numbers of other specific disease-related programmes under way, the focus had turned to ID. The view, as reflected by the Medical Department, was that ID was a disease or disease complex like any of the others which were being successfully dealt with and its control (or eradication) was a simple question of taking the appropriate actions. In 1962, it was urged that the high incidence of these diseases indicated the "need for placing more emphasis on safe rural water supplies and on adequate rural sanitary facilities" (MD1962), and in the following year a campaign began to provide water-seal latrines, to be manufactured by the villagers with financial and technical help from the Department.

In 1964, a rural health programme was launched, with aims that included stepping up the water-seal installations, and also the general improvement of rural water supplies, now seen as critical, which attracted aid from WHO and UNICEF. A Manual of Village Hygiene was produced and widely distributed in this year.

The divided jurisdiction over village public health referred to above had caused both concern and irritation to the Medical Department. In the late 1960s steps were taken towards resolution of the problem; steps which were important because they reflected the growing realisation that the "government within a government" was unworkable. In 1963, six inspectors from the Department were seconded as advisers to Provincial Councils, and in 1966 the Department was able to report that "three items [of legislation] this year [one to bring the village health inspectorate under the Medical Department and one to apply to the villages the public health regulations on the control of communicable diseases] had the effect of bringing Fijian villages more closely into the ambit of the general public health laws of the Colony" and were "welcomed as a further opportunity for the [Medical] Department to...make a positive contribution towards the improvement of rural health standards (MD 1966)".

The Provincial Councils remained, however, a separate system, and in his 1969 review of "the Fiji medical scene in the last year of the Colonial era", the Director of Medical Services, Dr.C.H.Gurd, was still lamenting that "under this split system,

the Fijian villages continue to lag behind the rest of the community....in the improvement of Fiji's environmental sanitation".

Therefore, in relation to the breakthrough, changes in the provision of sanitation were probably not a primary cause.

4.6. Nutrition

The post-World War II period saw a renewed interest in child nutrition and concern especially for the diet of the Fijian child.³¹ In the late 1940s two booklets on childrearing, including child feeding, were written by Fijian women and distributed by the Methodist Church. In 1949, a particularly influential book was published by the first Inspector General of the South Pacific Health Service, "A Guide to Pacific Island Diets" (Buchanan, 1949). This provided the first clear guidelines for health workers on the appropriate diet (including food weights) for infants and children based on local foods. It emphasised the essential proposition for successful child nutrition in Fiji:

It would be totally wrong to have the impression that a Melanesian or Polynesian child cannot be reared, from birth if necessary, by artificial feeding on natural food-stuffs available on a small atoll or in the hinterland of larger islands where cow's milk is unknown.

The research report of Bell and Wills (MD1950 and quoted in chapter IV) also included practical guidelines on weaning practices and child nutrition for health workers.

In practice, however, the European Health Sisters encouraged weaning well before one year, rather than the one to two years practised by many Fijian mothers. Some of the older District Nurses failed to support early weaning, while the younger nurses had been trained in the preparation of milk formulas. Until the mid-1950s there was conflict over nutritional goals and no clear message to parents on the appropriate nutrition for under fives, especially during the critical weaning period (Parkinson, 1991b). It was not until the mid- to late-1950s that practical guides for mothers were available which incorporated the recommendations of Buchanan, Bell and Wills and other nutritionists. Delayed weaning did not become the consistent advice of nutritionists until the late 1950s.

During the early 1950s, in part as a response to these reports, bulk skimmed milk was imported and re-packaged for local merchants. The 1954 Medical Department report suggested that this

improved the diet of Fiji-Indian families rather than Fijians. The fast breeding fish *Tilapia mosambica* was introduced in rural areas, distributed to ponds in many cases by District Nurses, to increase protein availability.

While serious malnutrition was not seen in Fiji children, Bell and Wills observed that the young child's diet was deficient in protein and calcium, that children had in "some cases" poor muscle tone and that there was a "high incidence" of skin infections (MD1949). Langley (1953), in the first quantitative food surveys of a Fijian village (summarised by Parkinson, 1991a), observed that "Women did not relate poor feeding to the condition of their children and many resisted advice from the nurse concerning the use of pawpaw and soft vegetable as a supplement for the breast milk." Although sugar, flour, rice and tinned foods were bought at shops Langley observed that "chicken, eggs and milk were not popular as foods." This study also suggested a conflict between cash cropping and family provision. Some of the foods best suited to infants, sweet potatoes and bananas, were included among those which were sold. Neither milk nor eggs appear to be significant in children's diets in the few surveys in this later period. Jansen and Boubela (1968), cited in Parkinson, 1991b), questioning mothers on their use of cow's milk, found that 40% never used it and 37% used it only occasionally. Their assessment of the nutritive value of the diets of 10 children aged 15-36 months showed that the average caloric intake was 59% of the recommended U.S. allowance for children of these ages. A later study suggests that no special high protein foods were prepared for young infants, although the diet of the rest of the community was "reasonably satisfactory" (Brookfield, 1975).

The limited evidence on nutritional patterns, especially in rural areas in this period, precludes a clear assessment of the contribution of changes in children's diets to improved child health. Certainly there was much more information of a useable kind for the motivated parent. In addition, there was increasing availability of high protein foods which could be stored without refrigeration, such as canned fish and powdered milk, although it is likely that few Fijian families made use of the greater availability of powdered milk. Not only was this a matter of taste but these foods depended on access to shops and money and in rural and isolated areas could be very expensive (Brookfield,

1975). In this period cassava was rapidly replacing other and more nutritious root crops as a staple. Between 1953 and 1963 "its contribution to dietary energy" rose from 36% to 59% (Thaman, 1991). The fact that deaths of young children continued to be attributed to inappropriate weaning practices suggests that while the nutrition of some children may have improved, this was unlikely to have been the case for children of the less motivated mother.

As with sanitation, changes in child nutrition were unlikely to have been a key factor in the breakthrough.

4.7. Disease-related programmes and campaigns: the disease environment

The Post-WWII period created new opportunities for medical provision as a result of new medical technologies and greater financial support for their use in developing countries. However, in a small country financing, organising and implementing these campaigns would have been a substantial challenge. In the breakthrough period and immediately before several programmes and campaigns were being carried out simultaneously. The focus on the breakthrough period makes it important to look closely at the timing of these programmes in order to weight their impact on the mortality decline. An evaluation of the contribution of immunisation and treatment programmes to "breakthrough" is hampered by very poor reporting unless they were part of a specific campaign. And apart from treatment campaigns such as the yaws campaign in 1955 or the hospital treatment of tuberculosis, the use of specific drugs -- including antibiotics -- is not reported.^{29a} The vaccination/immunisation, treatment and control programmes are analysed separately by disease or by the target group of diseases; and major childhood diseases with no treatment campaigns are analysed separately. The differential contribution of these different causes of childhood morbidity and mortality to overall mortality and the probable contribution of these control programmes to the "breakthrough" are discussed in Section 6.

4.7.1. DPT: Triple antigen vaccinations for diphtheria, pertussis and tetanus.

In many developing countries DPT immunisation programmes have been among the most important infectious disease prevention programmes. But Fiji is an atypical case. Very few cases of

diphtheria were ever reported. These few cases were typically schoolchildren, and were traced to visits or schooling outside Fiji. Neonatal tetanus was rare and more frequent amongst Fiji-Indians than Fijians. Thus, whooping cough (pertussis) was the most important target disease in the DPT immunisation programme. Stanfield (1978) has noted that the "fulfillment" of an immunisation programme will depend not only on the morbidity and mortality from the disease but on the "extent and degree of public anxiety and concern, and hence likely cooperation". In some periods whooping cough epidemics occurred as infrequently as every 8 years and mortality would have been concentrated in infants.¹⁰ Perhaps for these reasons the motivation on the part of parents to seek out DPT immunisation, where it was not readily available, was relatively weak. The epidemic years 1958-1959 were exceptions.

Anti-diphtheria and pertussis vaccines were available in clinics on a voluntary basis from the mid-1940s. Reporting of the uptake in the early years was poor. Numbers of disease-specific immunisations were not reported, nor were reports shown by ethnic group. In the 1940s immunisations for these diseases were only noted:

1943 Anti-typhoid and -diphtheria immunisation is "encouraged and usually accepted freely."

1945 "Some 16,000 prophylactic inspections and vaccinations have been given against typhoid, diphtheria, pertussis and smallpox by the health nurses in addition to those given by NMPs."

The 1951 Medical Report suggests that the availability of the vaccine was mainly in the larger centres: "All clinics, health offices, and District and Rural Hospitals provide free inoculations against pertussis and diphtheria..." There is no suggestion in these reports that vaccinations for these diseases were offered by District Nurses or AMPs on their rural rounds. In part, this limited availability may have been due to the lack of refrigeration in most parts of Fiji.¹¹

The 1955 Medical Report was the first to give numbers of DPT triple antigen inoculations for both Suva and rural hospitals, but even these numbers are difficult to interpret. In 1955 1,767 inoculations were given in the Suva Health Office and 2,617 in centres outside Suva; of the latter 61% were in Lautoka, indicating that they were probably not widely available in less urbanised areas. This vaccine requires three separate

inoculations. Based on later reporting showing numbers of separate doses, probably fewer than one half of this total of 4384 were first doses, that is about 2200.³² Even if these were all concentrated on births in that year, (n = 13,067), and there is no evidence that they were, only 17% of infants would have been immunised. Numbers immunised increased in 1958 and 1959, both years with significantly increased pertussis notifications. In 1959, for example, there were 8,151 doses given in major centres or (on the same principle as above) fewer than 4000 first doses. Births in 1959 numbered 15,919. Thus, although an increase over previous years, fewer than a quarter of infants would have been covered. The exceptional year was 1961 with 16,156 doses given (births = 16,595). These were concentrated in a few geographic areas and this number probably reflects the fact that the DPT immunisation campaign scheduled for 1960 was delayed but vaccine and medical personnel were available. WC notifications in 1961 were up by 41% so the effects on mortality, which are largely on infant mortality, could have been felt depending on the geographic location of the outbreak. However, there is little difference in the IMR (based on vital registration) between 1960 and 1961. 1962 is an epidemic year and the IMR increases from 30 in 1961 to 37.³³

The first full-scale DPT immunisation campaign was mounted in 1963-1964 as part of a campaign to immunise pre-school and school children against not only these diseases but also poliomyelitis and tuberculosis.³⁴ Under the pre-school programme begun in 1964, all children under 5 were to be given BCG, two doses of "Sabin type" oral poliomyelitis vaccine and three doses of triple antigen (MD1964). The numbers of immunisations given are shown in Table V-8.

Table V-8
Immunisation, 1964/65

BCG	Sabin 1	Sabin 2	Sabin 3	DPT1	DPT2	DPT3	DPT4	Tet Tox
80203	92530	75178	16230	60243	45685	35636	3693	93159

Source: Medical Department Report, 1965.

The target number of children for the campaign was reported as 100,000 including all ethnic groups, but it is unclear how this was set (MD1965). In 1963 the number of children under five was 78,327. The number of children between ages 5 and 6 was about 17,000, and these may have been considered "pre-school". DPT1 coverage would appear to have been excellent if, as

reported, these vaccinations were given with BCG and Sabin1 to the upper limit given in the table of 92,530 children, or if the difference between the total number of under fives or under sixes and the DPT1 number is children who were already covered. The coverage of DPT2 and DPT3 is less complete. It was argued by the Medical Department that

Whilst the proportion immunised with diphtheria and even perhaps pertussis may well be sufficiently high to have a break-point effect in the community, this effect does not, of course, apply with tetanus and there is obviously still a need for further actions with regard to this disease (MD1965).

Tetanus toxoid was given as a booster to children previously immunised and was also given to schoolchildren, so the numbers in Table V-8 are difficult to interpret (MD1964,1965). But if the overall number of cases receiving tetanus toxoid and (Sabin1) includes school children as well as under fives (and the report is unclear) then the coverage of under fives is much less complete.

While neither polio nor tetanus were causes of significant numbers of childhood deaths, these campaigns illustrate the activist approach of the Medical Department to any relatively preventable cause of mortality. Tetanus notifications had always been relatively rare; the average between 1950 and 1955 for the total population was 35 cases; the largest number in any one year in this period was 45. Despite the availability of DPT and tetanus toxoid from the late 1950s, tetanus notifications still averaged 46 in the period 1960 to 1964. In 1964 the ages of these cases were reported, showing that 25 of 48 (52%) were cases of neonatal tetanus. While immunisation of all mothers attending antenatal clinics was considered by the Government, it was recorded that this would be too expensive and would fail to reach those most at risk, who were likely to be non-attenders (MD1964). In 1965 half of the 28 cases were neonatal tetanus, and in that year half of all cases were from the Lau islands. All Lauans as a result were immunised against tetanus. In 1966, again exactly half of the 32 tetanus cases were neonatal tetanus and it is reported that of these 12 were Fijians. It is likely that at these relatively low rates neonatal tetanus had been present amongst Fijians for many years. The routine immunisation of pregnant women against tetanus was begun in 1966 and "certain traditional birth attendants were given simple courses of instruction in the hygienic management of accouchements

(MD1966). " About 3/4 of the neonatal tetanus cases reported each year died; in 1966 this would have been 9 Fijian deaths, or fewer than 1% of estimated deaths.³⁵

Table V-9A
Notified Infectious Diseases
Numbers and Rates per 100,000 Fijian population

	Pertussis	Tetanus	Tuberculosis	Yaws	Measles
1950	92 (70.8)	12 (9.2)	262 (201.7)	-----	100 (77.0)
1951	147 (110.6)	17 (12.7)	159 (119.6)	-----	1 (0.7)
1952	263 (193.5)	16 (11.7)	301 (221.5)	-----	0 (0)
1953	198 (142.0)	17 (12.1)	359 (257.5)	-----	1 (0.7)
1954	212 (148.1)	22 (15.3)	410 (286.5)	3933 (2748.4)	4 (2.7)
1955	351 (239.0)	18 (12.3)	214 (145.7)	5148 (3505.8)	4 (2.7)
1956	184 (124.2)	19 (12.8)	433 (292.3)	482 (325.4)	9 (6.1)
1957	96 (62.5)	19 (12.3)	234 (152.5)	132 (86.0)	4342 (2831.3)
1958	493 (312.4)	33 (20.9)	534 (338.4)	82 (52.0)	6 (3.8)
1959	444 (273.2)	23 (14.1)	445 (273.8)	56 (34.4)	3 (1.8)
1960	272 (162.4)	25 (14.9)	479 (286.0)	21 (12.5)	276 (164.8)
1961	384 (222.6)	20 (11.5)	393 (227.8)	19 (11.0)	62 (35.9)
1962	619 (348.2)	16 (9.0)	402 (226.1)	12 (6.7)	6 (3.3)
1963	451 (245.9)	26 (14.2)	386 (210.5)	18 (9.8)	1719 (937.4)
1964	281 (148.5)	23 (12.1)	394 (208.2)	24 (12.6)	2773 (1456.8)
1965	76 (38.9)	19 (9.7)	383 (196.4)	10 (5.1)	16 (8.2)
1966	33 (16.4)	22 (10.9)	347 (172.6)	13 (6.4)	20 (9.9)
1967	71 (34.0)	17 (8.2)	364 (175.5)	-----	2010 (963.7)

Table V-9B
Notified Infectious Diseases
Numbers and Rates per 100,000 Fijian population

	Dysentery	Enteric	Infantile Diarrhoea	Influenza	Dengue
1950	92 (70.8)	100 (77.0)	680 (523.4)	3740 (2879.2)	94 (72.4)
1951	84 (63.2)	36 (27.0)	474 (356.6)	1984 (1492.9)	20 (15.0)
1952	88 (64.7)	31 (22.8)	455 (334.8)	2365 (1740.4)	116 (85.3)
1953	80 (57.4)	20 (14.3)	1562 (1120.7)	1811 (1299.3)	18 (12.9)
1954	74 (51.7)	6 (4.1)	934 (652.6)	5261 (3676.4)	51 (35.6)
1955	61 (41.5)	17 (11.6)	881 (600.0)	2932 (1996.7)	25 (17.0)
1956	43 (29.0)	2 (1.4)	1400 (945.1)	3195 (2156.8)	12 (8.1)
1957	101 (65.8)	22 (14.3)	1374 (895.9)	7465 (4867.7)	5 (3.2)
1958	62 (39.3)	26 (16.5)	1116 (707.2)	6984 (4425.6)	3 (1.9)
1959	34 (20.9)	18 (11.0)	1221 (751.4)	10596 (6521.2)	13 (8.0)
1960	52 (31.0)	3 (1.7)	1732 (1034.1)	6597 (3939.1)	13 (7.7)
1961	73 (42.3)	5 (2.8)	2020 (1171.3)	6470 (3751.7)	3 (1.7)
1962	278 (156.3)	3 (1.6)	1676 (942.7)	24750 (13922.4)	14 (7.8)
1963	31 (16.9)	1 (0.5)	1504 (820.1)	10156 (5538.1)	0 (0)
1964	32 (16.9)	0 (0)	2177 (1150.8)	20710 (10947.8)	0 (0)
1965	62 (31.7)	0 (0)	2721 (1395.3)	14771 (7574.9)	1 (0.5)
1966	17 (8.4)	3 (1.4)	1843 (917.2)	18147 (9031.3)	0 (0)
1967	6 (2.9)	3 (1.4)	2667 (1278.8)	11067 (5306.3)	----

Pertussis notifications for Fijians, shown in Table V-9A, varied widely in the 1950s and 1960s, from 92 in 1950 to an average of 468 in 1958-1959, and 535 in 1962-1963, also epidemic years. These dropped dramatically in 1966 to 33. Between 1970 and 1980 notifications were under 5/100,000 for the total population in almost every year. Diphtheria rates were lower than 2/100,000 for the total population in all but 6 years between 1946 and 1969, after which they were zero. Tetanus rates averaged

just over 6/100,000 total population between 1965-1968 (dropping from an average of 11.7 in the 1950s) and under 1 in all except 3 years between 1969-1980.³⁶

Whooping cough was present in the Colony, and in some years at fairly high levels, for most of the breakthrough years. The DPT immunisation campaigns would have had some effect on mortality in some of the later years of the breakthrough period. However, the haphazard approach to immunisation in the early years is demonstrated by the dramatic drop in the notification rates from pertussis after the mass immunisation campaigns of the 1960s. Whooping cough mortality is looked at in relation to other diseases in Section 6.

4.7.2. Yaws

Yaws treatment, an important part of health care in previous decades, had deteriorated considerably during the 1940s. The high cost of the arsenic-based treatment during and after WWII had led to the substitution of bismuth salts (MD1953), a form of treatment that had been unacceptable to the Fijians in previous decades because of harsh side effects. As a result, many of those with manifest yaws failed to seek or complete treatment. These treatments also resulted in a large percentage of relapsing cases. Jamaican research had shown this to be as high as 15% in the first year after treatment and 25% in the second year (reported in Hill, 1953).

Yaws was again made notifiable in Fiji in 1953. In 1955, 5274 cases were notified and it was reported that "this by no means represents the incidence of this disease" (MD1955).³⁷ Supported by WHO and UNICEF, a colony-wide yaws control programme was begun in 1955 among Fijians. Trials with a single long acting penicillin injection (Penicillin aluminium mono-sterate) had proved acceptable and successful elsewhere (Levitan et al, 1953). All Fijians were to receive penicillin injections in a move to eradicate rather than simply reduce the prevalence of the disease (MD1955). The dramatic effects of this campaign are shown in Table V-9A. No cases of yaws were reported after 1968.

4.7.3. Tuberculosis

In light of the high prevalence of tuberculosis (TB) in Fiji and the fact that the importance of the contribution of tuberculosis to high rates of childhood mortality is as yet unknown, the intensive post-World War II public health efforts to combat tuberculosis are described in some detail, although a

full review is outside the scope of this thesis. Briefly reviewed are the scope of the programmes, the prevalence surveys and immunisation campaigns and the case-finding and treatment programmes.

The war interrupted research on TB in Fiji, but greater resources were available thereafter. War Memorial funds were directed to TB treatment and funds from outside Fiji, including Colonial Development and Welfare funds, became available in the late 1940s. The TB programmes were the most important public health initiatives in this period and this, to some extent, negatively affected the predominance of child welfare work. The aims of the programmes were in line with what today is considered best practice, although much less was probably known about the probable success of the various strategies adopted. Case-finding and treatment was coupled with mass vaccination programmes, as would be done today.

Tuberculosis was believed to be widely prevalent in Fiji from the end of the 19th century. The authors of the Decrease Report argued,

Tuberculosis is very widespread among Fijians whether it take the acute or chronic forms [and elsewhere in the Report] the whole race is tainted by various forms of tubercle; much of their inherent weakness is brought about by this taint (Rp 156 and 273, 1896).

Tuberculosis was viewed even then as an important cause of morbidity and mortality and this view persisted throughout the 20th century as evidenced in most medical reports.

Recently, Rodrigues (1991) has observed that "tuberculosis is a disease of adults".³⁸ However, recently Preston and Haines (1991) have suggested in their study of childhood mortality in the U.S. at the turn of the century:

There is evidence that tuberculosis was severely underestimated as a cause of or contributor to child, and even infant, mortality because its symptoms in children were less apparent than they were among adults. Autopsies in several cities (U.S.) around the turn of the century showed that 10% or more of infants who died were infected with tuberculosis (Von Pirquet, 1909, cited in Preston and Haines, 1991).

While tuberculosis was cited as the "leading" cause of death in only 1% of children under 1 and 2.2% of children 1-4 in this study of causes of deaths to infants and children (analysed below in relation to causes of death in Fiji), 19.2% of infants and 32.9% of children 1-5 died of respiratory diseases and 3.7% and

6.9% (respectively) died of meningitis, categories of deaths to which tuberculosis may have contributed (Preston and Haines, 1991). A "thorough" autopsy series by Naegeli in Zurich in 1900 (reported in Wilson and Miles, 1964) found evidence of TB in 17% of children, of whom 73% had died of that disease in contrast to 28% of adult deaths where 93% had evidence of the disease. This study supports the view that children with evidence of TB who die are significantly more likely to have died of this disease than adults. Tabutin and Willems (1995) show that TB was a leading cause of death in children 1-5 in England and Wales in the period 1848-1872, responsible for over 10% of all deaths and 20% of deaths from "infectious and parasitic" diseases. Udani and Maddocks (1978) assert that in developing countries TB has been a major cause of death in children. In a paediatric autopsy series in Bombay (N=3646, between 1961-1971), 9.8% of cases showed evidence of TB infection. As late as the 1970s, again in Bombay, in a period of declining TB mortality it was claimed that 7.2% of deaths to under fives were due to TB, where TB prevalence rates had previously been lower than those in Fiji. While the highest annual mortality from TB is in the age group 0-5 (Hershfield, 1991), mortality rates vary considerably across and within geographic areas. In developing countries these rates are particularly suspect owing to the small proportion of deaths that are medically certified and the relative difficulty in establishing that TB is the leading cause of death. Mortality from TB to children 0-5 in England and Wales was 600 per 100,000 between 1851 and 1860 (Hershfield, 1991). However, rates among Indians and Eskimos in the Northwest territories of Canada (1937-1941), populations which like Fiji had been relatively isolated, were 76 and 315 per 10,000 (respectively) while they were 5.2 in the remaining population (reported in Grzybowski, Styblo and Dorken (1976), based on a study by Wherrett in 1945).

In the breakthrough period in Fiji, only 30% of Fijian deaths were certified by an AMP or a doctor (MD1950) and there is no cause of death reporting by age and ethnicity. However, it is clear from hospital records that childhood forms of TB were commonly fatal, although few cases were found in hospital. The 1953 Medical Report shows that of the cases in the major hospitals with TB meningitis and CNS, 49% died. The numbers of these cases in hospital averaged about 25 in the early 1950s. The difficulty of diagnosing cases of childhood TB is frequently

noted (e.g. see Cronje, 1984; Hershfield, 1991). Thus these cases were unlikely to be diagnosed and taken to hospital.

In addition to the direct contribution of TB mortality to the mortality rate, it has been suggested that a synergism exists between other diseases and TB. Aaby (1992) has recently suggested a possible synergism between tuberculosis and measles severity. It is well established that whooping cough and measles can accelerate the progress of TB (Morley, 1978; Udani and Maddocks, 1978; Mercer, 1990). Miller et.al (1963) extend this to other serious infections of children. In this regard Udani and Maddocks (1978) write

In relation to the fate of the primary complex in TB, progression of the disease is more frequent in infants and in children below the age of 4-5 years when natural immunity is low, when the infection is often massive and repeated and derived from an open contact in the family, and when the child has poor nutrition and frequent infections. Measles and whooping cough are important factors which often lead to flare up of the old lesion or progression of the existing one.

Aaby (1992) has argued that this interaction is likely to work in both directions:

...synergistic relations between several infections occurring at the same time may also have had substantial effects on the severity of each of them ...It is likely that there was an important interaction between tuberculosis and measles in the past, such that measles paved the way for tuberculosis, and tuberculosis aggravated the severity of acute measles infection.

This theory has received some support from Murray (1991) in relation to an HIV/TB interaction. It is interesting to note that medical investigators observed in the Decrease Report:

Yaws occurring in children of tubercular parents is probably intensified in its severity, and children who have been weakened by a prolonged attack of it are the more prone to die of some form of tuberculosis. Adults also who bear marks of severe yaws in childhood are more liable to contract some form of tuberculosis in after-life.

Thus the decline in TB prevalence in a population, like the decline in smallpox prevalence in Europe in the late 18th and early 19th century, may explain changes in the trends and severity of other infections and may help to explain the smoothing out of peaks in the mortality curve (see, for example, Mercer, 1990). This is explored for Fiji in Section 6.

The high prevalence of TB in earlier periods is likely to have had indirect effects on child health. One is the decreased

capacity of mothers with active tuberculosis to adequately care for their children. About 54% of new female cases of TB were women between the ages of 20 and 39 (MD1959).³⁹

(a) Prevalence surveys and vaccination programmes

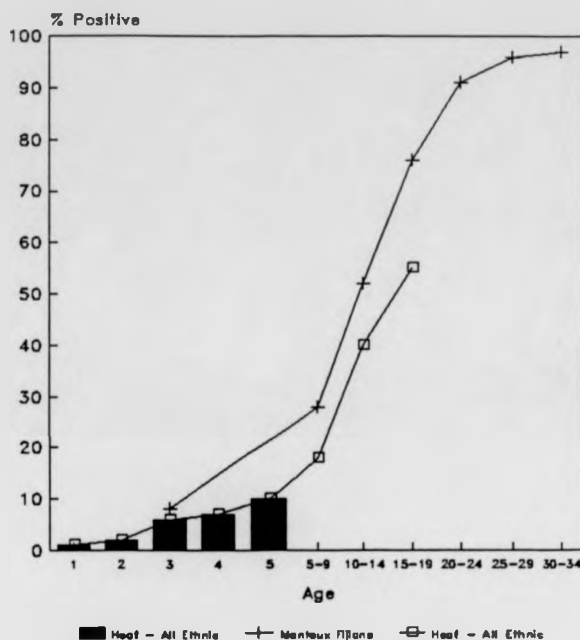
The first survey to establish the proportion of the population who were tuberculin reactors was carried out in 1937 by the American doctor, S.M. Lambert (MD1937). This survey of 8,110 Fijians in all age groups found 54% positive reactors to "Old Tuberculin (dilution 1/10,000)" (MD1937 and 1956). This is considerably lower than later surveys (see below) and probably reflects both the lower dose of tuberculin and the fact that reaction was read after only 48 hours.

The first large-scale post-war prevalence survey was begun in 1950. This survey was used to establish the proportion of the population who were tuberculin reactors, to locate negative reactors for "inoculation with BCG", and to help identify "active" cases, (MD1950). The Mantoux test was used (10 T.U., 1/10 cc. of 1/1000 dilution of "Old Tuberculin", read at 72 hours); the survey covered all age groups.⁴⁰ Between 1950 and 1953 14,342 Fijians were tested, about 10.6% of the Fijian population.

Figure V-4 gives the percentage positive in 5-year age groups for Fijians under age 35 and in 1-year age groups for those under 5.⁴¹ Of those under 5 years, 9.5 per cent were positive reactors. This survey was intended to find negative reactors who would receive BCG and this justified, to the medical authorities, the use of lower levels of tuberculin than might otherwise have been the case if the goal had been to locate positive reactors (MD1950).

Comparing proportions of positive tuberculin reactors across countries or communities is difficult as Fiji has a nutritional floor not found in many developing countries. Surveys from developed countries may therefore be more appropriate. Ideally comparable surveys would have used vaccine with the same dilution of tuberculin, reported using the same level of positive reaction after the same period of time. Data reported in Wilson and Miles (1964) and Miller et al. (1963) would suggest that the rates found in Fiji in the early 1950s are not unexpectedly high for a population before immunisation and the use of chemotherapy for TB.⁴²

Figure V-4 Tuberculin Reactors by Age
1950 and 1959 Campaigns



Source: 1950, 1956, 1959 MDR

Eskimo children in the Yukon-Kuskokwim delta reached levels of 90% positive reactors by age 7 (1 T.U., 8 mm.+ induration after 48 hours) but these are probably the highest recorded levels and may have been the result of a more recent introduction of TB (Comstock and Philip, 1961).⁴³ Surveys carried out on urban and rural children and young adults in India found up to 40% tuberculin positive by age 14 (Udani and Maddocks, 1978).

Table V-10
Level of Reaction to Mantoux Test
Numbers of cases and percent Fijians

Age	Children		Women		
	0-4	5-9	20-24	25-29	30-34
1(+)*	39 (31)	96 (15)	25 (8)	20 (6)	6 (2)
2++	45 (36)	205 (33)	114 (37)	112 (36)	112 (40)
3+++	37 (30)	294 (47)	153 (49)	154 (49)	137 (49)
4++++	4 (3)	33 (5)	18 (6)	28 (9)	26 (9)

Note: Figures in columns are number of cases; percentage Fijians are in parentheses.

* 10 T.U. read at 72 hours; + = an area of oedema 5mm. to <10 mm.,
++ = 10mm. to <20mm., +++ = 20mm. and over ++++ = oedema and
vesication or ulceration.

Source: Medical Department Report 1950

Prevalence surveys of this kind are of only partial use in assessing the prevalence of **active** tuberculosis, especially in children. Most of those infected do not develop active cases. The likelihood that the disease is active is related to the strength of the reaction (Miller et al, 1963; Udani and Maddocks, 1978). The level of reaction by age group in the first wave of the 1950 survey is shown in Table V-10.⁴⁴

However, there is no agreed reaction size at which active TB is presumed to be present (Hershfield, 1991). It is assumed in some populations that an infection under 10mm may be caused by atypical mycobacteria and not by **M. tuberculosis**. Additionally in very young children a large proportion of proven tuberculosis cases are non-reactors; this has been estimated at between 25-50% (Hershfield, 1991). At the same time, for clinical purposes, it is argued that, "the younger the child with a positive tuberculin test the greater are the chances of recent and active tuberculosis" and although symptomless these children are at risk of active disease after other illnesses (Udani and Maddocks, 1978). If a reaction size of 20mm is taken as presumptive of active TB, over 650 Fijian children under 5 (about 3.3%) would have had active cases in 1950; case finding in the late 1940s found fewer than 40 cases.⁴⁵ (Registered deaths to Fijians under five in 1950 numbered 562).

As seriously for the prospects of very young children, amongst Fijian women of childbearing ages about half were Mantoux

positive at levels 3 and 4, with an unknown proportion of active cases in this age group." Of neonates exposed to tuberculin infection Udani and Maddocks (1978) write:

This needs special consideration because of the high incidence of tuberculosis in adults, particularly pregnant mothers in underprivileged communities. As the exacerbation of a pulmonary focus after delivery is not uncommon, a neonate is at great risk of contracting tuberculous infection, with serious and often fatal complications like miliary tuberculosis and meningitis.

The BCG programme in Fiji continued in the years between 1954 and 1957, although numbers of vaccinations are not reported by ethnicity or age.

The 1958-1959 BCG campaign aimed to test (Heaf) all those under age 20 in the geographic areas covered by the survey; to vaccinate (BCG) non "reactors", and to examine, clinically or by X-ray or both, all "reactors" who were under age 5 years and those who showed a "plus 3 and plus 4" reaction who were over age 5 (MD1959). The campaign was extended and by 1962, 136,887 persons 20 years of age and under were tested; 96,387 (70%) were negative and vaccinated. The ethnicity of those tested is not reported. The total tested represents about 60% of those aged 20 and in all races (based on the estimated population in 1960, RG1960).

The immunisation campaign of 1963-1965 included in its remit BCG vaccination of all under-fives with no obvious BCG scar. These ultimately numbered 80,203. Since some children would have received a BCG vaccination in clinics, this represents good coverage of the target group (as defined above). Babies born in hospital were routinely given BCG from about 1962 and it was "hoped" to extend this to all births in later years (MD1962).

In 1966 the TB campaign was directed at Fijian adults and all school leavers. All negative Mantoux reactors were given BCG and all positive reactors were given a chest X-ray and treatment as appropriate (MD1966).

(b) Case-finding and follow-up

As argued in a recent paper of the Scientific Committee of the International Union Against Tuberculosis and Lung Disease,

It must be stressed that the most powerful weapons for controlling tuberculosis and altering the epidemiological situation in a community are **case-finding, case-holding, and chemotherapy** (Hershfield, 1991).

Along with the immunisation campaigns these formed the

basis of post-World War II TB health policy. While a tuberculosis register was created in 1947, the early work was hampered by uncertainties of diagnosis by medical practitioners in rural areas. The specialist tuberculosis hospital (Tamavua) was opened in 1946; over the next decade TB beds were added to some of the larger hospitals. By 1954 there were nearly 400 dedicated TB beds in the main hospitals. AMPs (Fijian local doctors with 3-4 years of intensive hospital training) were given special training in diagnosis and treatment. X-ray facilities were established in the largest medical facilities and in 1954 a portable x-ray unit was put into use throughout the rural areas of Viti Levu which could be reached by road.

The 1958 Medical Report outlined the control measures which were then being used and which continued to be used. These included:

- (a) improvement in case finding through clinical examination, tuberculin testing and, where possible, bacteriological examination and X-ray;
- (b) immunisation of the susceptible with BCG vaccine;
- (c) segregation of the infectious cases in hospital...;
- (d) follow-up and review of cases discharged from hospital;
- (e) increased surgical treatment of cases that do not respond readily to medication;
- (f) use of INH in young children who are positive tuberculin reactors and for the chronic cases who are unsuitable for surgery;⁴⁷
- (g) improvement in general standards of living, and
- (h) health education.

Between the years 1946 and 1966, 10,603 active cases of TB were notified.⁴⁸ About 70% of cases were Fijians. Between the years 1950 and 1955 11.2% of new cases were children 0-5, an average of 55 cases a year.⁴⁹ As these numbers, reported annually, represent only the limits of case-finding they cannot be used to calculate either prevalence or incidence. The total population in the 1956 census was estimated at 345,737, of whom 148,134 were Fijians. In that year the rate of case-finding was 286.6 per 100,000 Fijian population.

The scale of the medical effort is shown by the work of the Tamavua Hospital which had 3350 TB inpatients in the period 1951-1961 and 31,455 outpatients for "full review", which included chest x-ray, sputum tests, blood tests, full history and clinical examination (MD1957).⁵⁰ Although numbers were not reported annually for the other larger hospitals, in 1961 Lautoka Hospital had 152 TB admissions (contrasted with Tamavua's 342), 129 supervised domiciliary cases, and 1,704 outpatients (contrasted

with Tamavua's 4,926) for full review. Thus a significant part of the work on case-finding and control took place in hospitals other than Tamavua. Supervision of domiciliary patients was also undertaken from rural hospitals (MD 1961). Treatment was "standardised as far as possible throughout the colony", although all x-rays of new cases were reviewed at Tamavua (MD1959). These numbered 15,589 in 1956, one of the peak years.

Between 1946 and 1950, based on notifications, the number of active TB cases notified averaged 311 per year, a rate of 244 per 100,000 Fijian population. This rate declined modestly until the mid-1960s (Tables V-9A and V-11).

After 1972 rates begin to decline sharply, and for 1977-1980 the average was 50. The numbers of notifications in a given year reflect the limits on case finding. They are "new" cases only in the sense that they had not previously been identified and/or could not be found a hospital place. The limited fall in the numbers notified in the later years of the campaign does not, then, reflect the vigour of the campaign or the decreasing prevalence of the disease.

Table V-11
Tuberculosis (Hospital Morbidity*)
Numbers and Rates per 100,000 Fijians, 1946-80

Years	Numbers	Rates
1946-50**	311	243.6
1951-55**	289	206.7
1956-60**	425	267.5
1961-65**	391	224.0
1966-70**	369	172.1
1972-76**	181	73.1
1977-80***	138	50.1

* CWM, Lautoka, Labasa, and Levuka Hospitals.

** Five-year average. *** Four-year average.

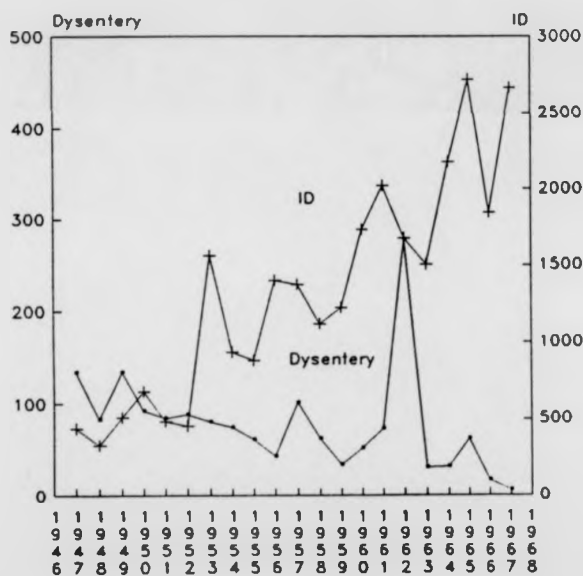
In relation to child health, the numbers vaccinated as a result of the BCG campaigns and the numbers of active cases removed from the community and treated were the significant factors.³¹ By the late 1960s there were no reported hospital deaths from the types of TB most commonly found in children.

The possible effects of the decline in TB prevalence on the breakthrough in childhood mortality are discussed in Section 6.

4.7.4. Infantile diarrhoea

Diarrhoeal diseases are one of the leading causes of death of children in developing countries. Until the wide availability of oral rehydration therapy, treatment was limited to proper feeding practices and in the severe cases which reached hospital, drip rehydration therapy. This therapy had been available in Fiji for some time but is likely only to have been in hospitals. Oral rehydration therapy reached Fiji after the breakthrough.

Figure V-5 Trends in Infantile Diarrhoea (ID) and Dysentery Cases (Fijians)
(Note double axis)



Infantile diarrhoea (ID) became notifiable in 1947. The number of reported cases increased dramatically, reflecting the greater interest in the disease (Figure V-5). There was probably some slippage between reporting infantile diarrhoea and dysentery. In most years dysentery numbers were low. The numbers of ID cases reported in selected years and the rates based on the numbers under two years are shown in Table V-12.³²

Table V-12
Infantile Diarrhoea: Cases Notified, 1946-66.

Year	Cases notified		Rates per 1000 aged <2*	
	Fijians	All races	Fijians	All races
1950	680	918	79.6	44.1
1956	1400	2369	135.9	92.8
1960	1732	3295	145.0	116.8
1966	1843	4477	127.9	138.8
1970	2635	6988	168.2	201.6

* The population base is taken from the Registrar-General's annual reports.

Disproportionate numbers of cases in the early years of notification appeared to occur amongst Fijian children. These were reviewed each year and their numbers were seen to reflect both poor sanitation and poor weaning practices. Extracts from the 1952 and 1957 Medical Reports are typical:

The leading factor in this large incidence (reported cases are a small proportion of probable true incidence) is the feeding methods in Fijian villages which are specifically excluded from the application of the Public Health Ordinance.

The incidence [of infantile diarrhoea] remains far too high. A certain number of cases are due to faulty feeding, particularly at the weaning period, but the majority are probably due to poor environmental sanitation, especially in rural areas.

Underlying the continued criticism of Fijian parents and the quality of village sanitation is the chafing of the Medical Department at the fact that the villages did not come under its public health authority. However, as reporting improved among Fiji-Indians it became clear that the rates were as high or higher in this community.

The variation in the numbers of cases (Figure V-5) and rates is, no doubt, due to the presence of different pathogens in different years as well as environmental factors such as flooding (e.g. 1964 and 1965). It undoubtedly also reflects the Medical Department's efforts in some years to encourage parents to seek treatment which would, in turn, increase notifications. ID is a disease which is likely to be seriously undernotified as death can occur very quickly especially in the young infant; the less serious cases are, therefore, likely to come to the

attention of the authorities and the very serious cases may be near death. This is confirmed by one report.

A 1966 inquiry into the type and severity of ID cases found that:

some 90% of the cases were mild, showed no evidence of dehydration and recovered quickly. The age distribution indicated that they are probably due to maternal ignorance in feeding babies as they seem to occur most commonly at the weaning age (MD1966).³³

However, the fact that there was marked seasonal variation and rates were higher in periods of flooding would suggest that poor weaning practices were only one cause of ID, although other factors may have had their maximum impact at weaning ages.

Of notified cases, 2-3% required (drip) rehydration therapy (between 115 and 135 cases in the mid 1960s), of which it is reported that as many as 30% died (MD 1966 and 1967). However, those who arrived at hospital are likely to be disproportionately older children whose chances of survival are greater and as noted above the very young infant with serious ID is likely to have died quickly. The reported deaths from ID were extremely low. These are not reported until the late 1960s and at the highest rates in this period were about 1.2 deaths per 1000 children under two years. Two studies cited in recent reviews give reasonably reliable estimates of diarrhoea-associated deaths for every 1000 children in the community; these are very different from each other -- 3.4 and 18.0 deaths per year per 1000 children under five years (Kirkwood, 1991b).³⁴ The very low rate for Fiji, however, undoubtedly reflects poor reporting of cause of death, as diarrhoea-associated deaths would have been a significant proportion of all child deaths (discussed in Section 6).

In this period medicine and treatment were hampered by poor knowledge of pathogens and cumbersome modes of treatment, usually in hospital. It is only in the 1970s that the majority of pathogens responsible for diarrhoea in children could be identified (Black, 1984). In the absence of such knowledge, and knowledge of the modes of transmission, effective prevention was hampered. While a general concern with improving sanitation, as existed in Fiji, was appropriate, it is now known that hand washing and special care in the preparation of weaning foods are important in interrupting the transmission of the important pathogens (Black et al., 1981), including Shigella (Khan, 1982).

Although there were spikes in the numbers of dysentery cases reported in some years, in most years they were relatively low. The reasons for the decline in the virulence of dysentery are not clear. The measles epidemic in 1957 produced a minor spike in dysentery in the same year and the last major spike occurred in 1962, a year with whooping cough and influenza epidemics. Adults are likely to have developed immunities from the repeated epidemics of the 1930s but this would not have applied to children.

4.7.5. Poliomyelitis

An epidemic of poliomyelitis, although localised to several areas, occurred in 1958 resulting in the notification of 328 cases, all with some paralysis. This was not a disease with which medical professionals in Fiji had hitherto had experience, although serological tests of unaffected adults (in areas where the epidemic had not spread) showed immunities to three types of the virus (MD1958). This suggests that it had been introduced previously. Of the notified cases, 75% were under six years of age. The large number of influenza notifications relative to other years suggest that the virus may have affected much greater numbers. The response to this epidemic, relative to others in this period, was muted; vaccinations were offered for payment.

The 1963-1965 campaign included Sabin type oral vaccine (two doses) to all those in the target age groups (see Table V-8).

4.7.6. Smallpox

Smallpox vaccinations were routinely given in the child welfare clinics in this period, and by district nurses and AMPs, but full numbers were not recorded. In 1960 a possible case of smallpox was identified from Niue island (not part of the Fiji group). This resulted in a campaign to vaccinate as many as possible of those in and near ports of entry to Fiji. In Suva, Lautoka and Nadi, 40,000 people were vaccinated in 14 days (MD1961). Smallpox vaccination continued for children and for those working near the ports (MD1965) as part of routine care.

4.7.7. Enteric fever

The response to outbreaks of enteric fevers (analysed in previous chapters) had been aggressive from the late 1920s. Controls included immunisation, quarantine and rapid identification of causes especially in densely populated areas. The anti-typhoid programme was "accelerated" during 1950, and TAB inoculations in the tens of thousands were given in clinics and to school children thereafter.⁵⁵ In 1956 these numbered 40,849 (ages of children are not reported). Table V-9B shows the notifications for this period. After 1952, notifications in most years were under 20 cases.

4.7.8. Hookworm

Hookworm, which had been a serious cause of morbidity in the past, was a solved problem before the breakthrough period. The 1950 Medical Report summarises:

This disease which was prevalent in past years is now declining due undoubtedly to the use in Fijian villages and Indian settlements of borehole latrines with concrete slabs and pedestals. It is very rare to see any physical effects of hookworm infestation which was so evident before sanitary latrines were brought into use.

Hookworm treatment was given to all sections of the community and health education was reported "to play a big part" in maintaining the low prevalence of the disease.

4.7.9. Filariasis

From the mid-1940s considerable efforts were undertaken to eradicate filariasis. Fifteen percent of the population was estimated to be infected with *microfilaria bancrofti*, based on blood samples of 70,000 Fijians (MD1950). Rates varied by geographic area.⁵⁶ From 1944 onwards, trained Filariasis Inspectors were stationed throughout Fiji. In the early 1950s there were 45 locally trained Filariasis Inspectors whose job it was to inspect villages (N=1049) and schools. Research and

control were primarily aimed at identifying and eliminating vector habitats, although some treatment trials were carried out in the breakthrough period (Symes, 1960; annual Medical Reports). However, this work was "not followed up, largely because of the priority claims at the time of other control programmes (MD1969)". Throughout the period, local surveys suggested that if the rate of filariasis declined, it did so very modestly (MD1956 and 1960).³⁷ It was not until 1969 that the Filariasis Control Campaign reduced the microfilarial rate significantly to 1.75% of follow-up cases in infected areas (MD1969). This campaign focused on the medical treatment of villagers rather than vector control alone.³⁸ The campaign continued after 1969 in other infected areas.

4.7.10. Important childhood diseases with no control programmes **Respiratory diseases**

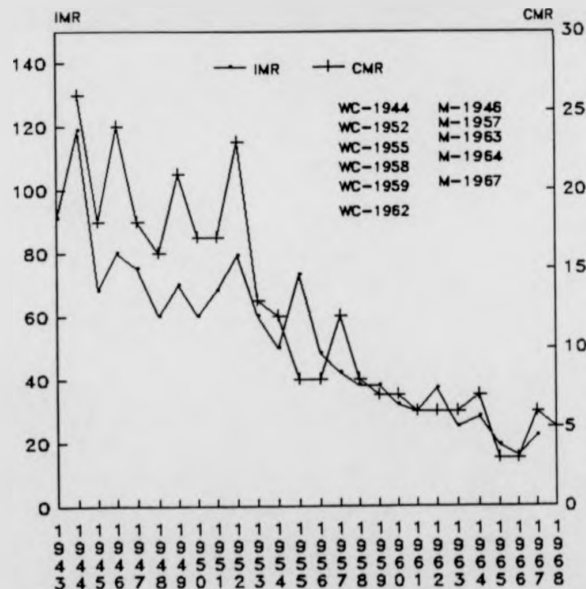
Research in the last two decades has shown that respiratory diseases were historically important in contributing to high rates of childhood mortality (Preston and Haines, 1991; Mercer, 1990). Recent research in developing countries has also established the importance of the ARIs in maintaining high levels of childhood mortality (Kirkwood, 1991a). Surprisingly, these diseases are nowhere singled out for analysis in government reports in Fiji between 1940 and 1970, nor were they notifiable. This may have been due to their very high prevalence and the difficulty in separating the serious cases from the others in rural areas. In the 1970s, when hospital morbidity is reported by age (but not by ethnicity and age), respiratory diseases were responsible for about 35% of cases aged 0-5 treated in hospital. If perinatal causes are removed, this percentage is over 40%. In one of the only reports of cause of death by age and ethnicity (Bavadra et al., 1982), based on 1971 reports, respiratory diseases were responsible for 30% of deaths of under-fives and 37% once perinatal deaths are removed. There is no report of treatment for respiratory diseases. Although antibiotics were available in the Colony, there is no suggestion that they were routinely used and because of their expense, administration by injection ^{in some cases} and need for refrigeration, it is unlikely that they were used outside the main hospitals, if there.

Measles

The importance of measles as a cause of morbidity and mortality has been difficult to establish throughout this inquiry

and this remains the case in the breakthrough period. The Colony was, even in the 1950s, too small to sustain this infection, yet measles is notified in small numbers in most years outside the epidemic years of 1957, 1963-1964 and 1967 (Table V-9A). These may be misdiagnoses, or increasing international travel may have brought regular reintroductions, or both. Measles was considered to be a "mild" infection throughout the period, although Fijians and other Pacific Islanders were considerably more susceptible than the other component groups. In 1969 mass immunisation was considered and rejected on the grounds that "measles in Fiji is a very mild disease with negligible mortality (MD1969)".

Figure V-6 Mortality In Epidemic Years
Fijians (note double axis)
Rates based on Vital Registration



The measles epidemic years (1957, 1963-1964, 1967) show no significant spike in under five mortality after 1946 as measured directly by q5. The last significant spike in q5, modest by former standards, occurred in 1952, probably as a result of whooping cough. Thus it would appear that measles and the

secondary consequences of measles did not contribute disproportionately to morbidity and mortality in these years; the perception which was held by the Medical Department. However, an analysis of the component mortality rates suggests that this is probably not the case for at least two of these epidemic years (Figure V-6).

The CMR increased from 7.9 in 1956 to 12.2 in 1957, although there was a decrease in the IMR from 48.2 to 42.3. On the other hand in 1963 the CMR is approximately equal to that in 1962 (5.8 and 5.7), although there was a slight rise in the CMR from 5.8 in 1963 to 6.6 in 1964. (The IMR shows a sharp drop from 36.7 in 1962 to 25.4 in 1963. 1962 was a whooping cough epidemic year, and showed a peak in dysentery and influenza; the 1964 IMR is 27.9.) In 1967 both infant and child mortality increased over the previous year; however, 1966 was the first year following the completion of the immunisation programmes which would have contributed to lower rates in that year. What might account for the possible differences in the effect of measles on child mortality in different periods?

The measles epidemic in 1946 was the last major epidemic until 1957. Thus all of those born in the intervening period were susceptibles. In 1956 there were 45,044 Fijians under 10 years of age and 20,314 under 5. The numbers of measles cases notified in 1957 was 4,342, fewer than 10% of susceptible cases. Mild cases, and these are more likely to occur amongst older children, are less likely to be notified (i.e. to have their cases brought to the attention of a medical practitioner). If all of the notified cases occurred to children under 5, this would mean that 18% of children of these ages would have had measles serious enough to see a medical practitioner.⁵⁹

Aaby's research (see especially 1992) would suggest that the higher mortality in 1957 is likely to be related to the number of susceptibles. The more susceptibles in the population the greater chance that more than one case will be present in a household giving a higher infective dose, especially from older children to younger. In 1963-1964 susceptibles would have been concentrated amongst younger children. Also, the 1963-1964 epidemic occurred during the immunisation campaign for pre-school children; thus the possible higher mortality due to measles would be confounded with the lower mortality due to both immunisations and the greater interaction of medical professionals and

children. The higher rates in 1967 are more difficult to explain. However, the CMR is only **relatively** higher i.e. higher than 1966. The actual rate is lower than in 1964 and half that in 1957.

The contribution of measles and its sequelae to childhood mortality over this period is difficult to estimate with these limited data. What is important in relation to the breakthrough is that although measles is likely to have caused an increase in mortality in the measles epidemic years, in relation to the epidemic years of the 1930s and 1940s mortality was low. This suggests a change in the pathogenicity of measles, the better control of potential synergistic pathogens, the resistance of the population or all of these. Although the late 1950s and early 1960s saw numerous outbreaks of serious infectious childhood diseases, the sharp peaks in mortality did not occur.

5. The Social Context Prior to and During Breakthrough

In this section social and economic factors are reviewed which recent research on mortality suggests might have contributed to the mortality breakthrough in Fiji is this the point to cite this other research. These include the factors Caldwell identified as necessary conditions for the successful exploitation of the additional health inputs which accompanied breakthrough in his selected countries.

Since the publication in 1976 of McKeown's book "The Modern Rise of Population", any explanation of an historical decline in mortality must include some assessment of changing living standards. However, the concept is sometimes poorly specified, as in McKeown's own work (although nutrition is strongly implicated), and is difficult to operationalise in terms of specific effects on individual lives from studies which use aggregate measures of living standards e.g. per capita income (e.g. Preston, 1975). Looking at a relatively short breakthrough period reduces the likelihood that major changes in economic and social life will explain significant demographic change. It is nonetheless important to assess whether there were any abrupt changes in the social context just prior to breakthrough and/or whether the breakthrough is simply the result of the lagged effects of earlier social changes. And we are interested here in whether the breakthrough conforms to the characteristics of the social context which facilitated the mortality breakthrough in other countries.

There is no evidence of any significant change in the economic well-being of Fijians in the post-war period. For the great majority of Fijians, life in the 1940s and 1950s remained village-based. In 1946, only 9% of Fijians lived in towns.⁶⁰ Native Regulations, under the Fijian Affairs Board, restricted migration and freedom from communal obligations. In 1950 Ratu Sukuna described the Fijian life as follows:

Though we see indisputable signs of native progress, the Fijian is still at heart a subsistence agriculturalist with a simple conception of life--his clan institution and the thatched houses of his boyhood, his land and the peace and leisure of his **koro**. (FA1950)

Economic development for Fijians, under the new Fijian-headed administration ("the government within a government"), was with few exceptions based on village and communal development (Lal, 1992; Spate, 1959; Burns, 1960). In 1956 11% of the Fijian population lived in towns, and 25% lived apart from the villages in which they had a right to land (1956 Census). The 1966 census shows that 24% of Fijians lived in "urban and peri-urban areas", although only 14% lived in "towns" as defined by previous censuses. This larger percentage of 24% reflects changes in census definitions from previous censuses. In 1966, only 24% of Fijians lived away from the province of their birth (1966 Census).⁶¹

The 1956 Census offers a picture of the economic status of Fijians. The great majority of Fijian men worked in village agriculture with relatively limited opportunity for cash earnings. Table V-13 shows the predominance of work in the agricultural sector (CR1956).

Of those involved in village agriculture (about 56%) 31% grew no cash crop, 33% grew copra (which in times of depressed prices was harvested unenthusiastically, FA1950), 30% grew some vegetables and fruit for sale, and 5% sold other products. Of those in specialist agriculture and pastoral industries (about 8%), the great majority were involved in growing coconuts (41%) or sugar cane (40%); fewer than half of these "owned or leased the land". (McArthur, 1958) The 1966 Census gives a very similar picture -- 612 of every 1000 Fijian men still worked in agriculture; the only significant change in the distribution by sector is an increase in services.⁶² There was a marginal increase in the proportion growing cash crops from 69% in 1956 to 75% in 1966. However, the cash which was earned did not

necessarily compensate the individual worker; these were often village enterprises which had to pay village and communal costs and taxes.

Table V-13

Proportion of Male Fijian Population Engaged in Each Major Group of Industries, per 1000: 1956 Census.

Industry Group	Age 15-29	Age 30-44	Age 45-59
Agricultural and Pastoral*	621	661	755
Other Primary	61	51	30
Secondary	29	28	21
Construction	70	52	35
Commerce	29	28	23
Transport and Communications	33	28	14
Other Service	21	22	19
Entertainment and Personal Service	12	9	10
Administration and Government	21	32	18
Professional and Allied Workers	44	48	36
Miscellaneous**	28	21	8
Total Economically Active	969	980	968
Male Population (N)	17986***	12452	6844

* Includes "village or subsistence agriculture with or without specified cash crops and specialist agriculture" (63.6% of males over age 15).

** 70% Armed Services; 30% not specified industries.

*** Excluding persons attending school.

Source: McArthur (1958)

Table V-14

Net Profit Assessed for Tax: 1957
Individual and Partnership Businesses

	N Persons Assessed	Percentage	Net Profit Assessed	Percentage
European	634	6.2	696,201	14.9
Indian	9076	88.6	3,582,301	76.8
Chinese	401	3.8	348,494	7.4
Fijians and others	134	1.4	41,815	0.9
Total	10,245	100	4,668,811	100

Source: Burns (1960)

The quite dramatic differences in the economic life of the two largest ethnic groups, with populations at this time roughly equal in size, is shown in Table V-14 which gives the Net Profit Assessed for Tax based on individual and partnership businesses in 1957. Fijians contributed less than 1%, while Fiji-Indians contributed 77%. Only 134 Fijians were assessed for business

taxes in contrast to 9,076 Fiji-Indians.

Although personal income is not reported for this period, the limited income of Fijians would have had many demands on it, from the **kerekere** of family and obligations to chiefs to provincial taxes. Ratu Sukuna writes:

[The Fijian] never forgets that he has a double economy and that what he loses in the swings he gains in the roundabouts. A number of Fijians -- and a small number at that -- do not fit into this picture; but very few of them ever ignore a levy by the clan or the group (FA1950).

The fact that the Fijians lagged behind the other communities in economic development, and remained "predominantly in the subsistence sector" (Lal, 1992), became a major preoccupation of government in the late 1950s. Two influential inquiries dealt with these issues, although changes in economic policy were not to come before the end of the next decade. Their existence shows the very limited economic development which had occurred in the post-war period. The first was carried out in 1958 and 1959 by Professor O.H.K. Spate, a geographer from the Australian National University. He addressed what he described as "the unresolved conflict [in traditional Fijian society] of contract and money against kinship and status" (Spate, 1959). However, his work was overtaken by the Burns Commission, set up in 1959 with the broader remit to inquire into population trends and natural resources in the Colony.

In its 1960 Report, the Commission dealt at length with:

the gulf [in economic development] that now exists between the races.....[it is] due not only to ethnic, religious and linguistic differences, but to different customs and habits and especially to the different sense of values as between the races. The Indian is an individualist while the Fijian has been accustomed...to community life...The Indians...are hard workers, acquisitive of land and money; the Fijians, accustomed to a communal system which shields them from the effects of poverty, are generally disinclined to excessive labour and are careless and easy-going with money...[The Fijian nature and culture] have been a handicap to them in competition with other (immigrant) races...the Fijian...has cause to be concerned about his economic backwardness and is beginning to realise this (Burns, 1960).

Despite this assessment, many Fijians were showing their dissatisfaction with village-based life and its economic constraints by moving to areas with greater economic opportunities. Ward's (1965) excellent analysis of internal migration and its economic and social causes and consequences documents the desire of many Fijians to move outside the village

system. In particular his analysis of provincial differentials in the proportions of Fijians living outside their traditional villages in relation to the major sources of cash income in these villages, and his analysis of the changes in population density by province between 1946 and 1956 document the dissatisfaction that many Fijians felt with the opportunities in their home villages and the constraints of communal obligations. The movement was largely away from traditional employment to areas that supported wage employment and new industries. He writes,

In addition to the distinctive age composition of the Fijian migrants, there is evidence to support the view that it is those with the most drive, initiative and will to succeed who leave the villages ... Probably the biggest single factor influencing the attitudes of younger men has been service in the army during World War II and subsequently in Malaya.

However, families did not migrate intact and children were often left in the villages. And, then as in more recent times, there was considerable "circular migration" with many men leaving to work for relatively short periods and returning to the villages. Throughout the breakthrough period, as before it, the Fijian population remained highly dispersed. The 1956 census recorded 1,121 Fijian villages, with an average size of 96 people. Throughout the period well over a third of Fijians still lived in the more remote areas. In 1946, 18.7% of Fijians lived in Vanua Levu and 20.9% in the outer islands (excluding the Yasawas); these proportions were 19.2 and 19.6 in 1956 and 18.2 and 17.4% in 1966. A large, although declining, proportion of the Fijian population of Viti Levu lived in the interior. Ward (1965) reports that 17% of the Fijian population of Viti Levu lived 10 miles or more from the coast, in contrast to 4% of Indians.

The move to the towns was disproportionately composed of young men in the period 1946-1956. In 1956 39% of the Fijian male population of Suva was between the ages of 15 and 29 in contrast to 26% of the comparable Fijian population of the whole colony. (The percentage of Fijian women in this age group in Suva was approximately equal to that in the whole Colony.) In 1966 the percentages of men in this age group (Suva and Colony) were 34 and 25. However, in the period 1956-1966 increasing numbers of young women moved to Suva. By 1966 the percentages of women aged 15-29 in Suva and the Colony were approximately equal to those of men. Children under 5 made up a smaller percentage of the

Suva population than anywhere in the Colony. In 1966 this percentage was 15 in contrast to 17 for the Fijian population as a whole, and 19-20 in more rural provinces. The child/women ratio for Suva was .53 compared to .78 in the Colony. (This reflects not only reflect possible fertility differentials; children were known to be left in the villages while parents worked away.) The urbanisation of the Fijian population affected proportionately fewer children than adults.

Despite the fact that some Fijians were seeking wider economic opportunities, there is no evidence that economic development or substantial urbanisation, with possibly easier access to health care for some, played a significant part in the mortality breakthrough.

In other areas of life, the breakthrough period was one of rapid social change. The late 1940s saw the beginnings of public transport, with a round-the-island bus service on Viti Levu. The Fiji Broadcasting System began in 1954 with trilingual programming. These factors may have contributed to greater access to health care and knowledge of the available health services for some. Between 1952 and 1956 800 Fijian men served in the Malaya war. This may have created hardship in some villages and, on their return, contributed to the desire on the part of younger men to loosen communal ties.⁶³ The desire for higher (or different) living standards may have changed.

From the perspective of the Fijian population perhaps the most important post-war change in the Colony was the numerical preponderance of the Fiji-Indians. (In the 1946 Census Fiji-Indians numbered 120,414 and Fijians 118,040; by 1956 the difference had widened to 169,403 and 143,134.) Throughout the Colony's history, Fijians had publicly expressed dissatisfaction with the existence of a large immigrant population. The fact that Fiji-Indians did not participate in the war effort, together with labour unrest in 1959 and 1960, brought renewed calls for the repatriation of Indians, which were put to, and rejected by, the Burns Commission. In a 1950s survey, 63% of Fijians "expressed complete intolerance of the presence of Indo-Fijians and 25% wanted them to remain in the Colony but only on terms favourable to the Fijians (Lal, 1992 from Cato, 1955)". That the imbalance in population numbers was a motive for the Fijian unwillingness to control fertility has been suggested by some, including Timoci Bavadra (later to become Prime Minister), who

argued that the limited use of modern contraceptives was explained *inter alia* by "fear of political domination by immigrant Indians, who outnumber indigenous Fijians (Bavadra and Kierski, 1980)". Certainly in the 1930s the fear of being overtaken by the Indians had been used in urging Fijians to reduce child mortality, and it cannot be discounted as a powerful incentive to promote child health.

Let us now turn to the Caldwell model and examine the social factors which he suggests are exceptionally important in facilitating breakthrough: the education of women, women's autonomy and political will at the grassroots. We will look at each briefly.

From the end of World War II the government involvement in education, both in administration and teacher training, increased, following the recommendations of the Stephens Report of 1944. In 1948, all registered teachers were made civil servants (Lal, 1992; Whitehead, 1986). Fijians had had high literacy rates for several decades, as has been shown. The proportion of Fijians, both women and men, who had completed at least 6 years of schooling, in contrast to Fiji-Indians, is shown in Table V-15, as reported in the 1966 Census.⁶⁴

Table V-15

Proportions of Fijians and Fiji-Indians who Attended School for 6 Years or More, 1966

Ages	Fijians		Fiji-Indians	
	Female	Male	Female	Male
15-19	86	88	58	75
20-29	81	84	42	67
30-39	70	80	20	47
40-49	51	69	8	31
50+	30	48	3	16

Source: Zwart (1968).

As this table shows, the proportion of women in successive age groups completing more school than lower primary had increased over time and the proportions of men and women with this level of education were approximately equal. However, most of the children born during the breakthrough period would have been born to women 30 and over in 1966, i.e. 20 and over in 1956, women with relatively high levels of education in relation to

many developing countries today. It is important to reflect, however, that in previous decades relatively high levels of literacy had not been sufficient to bring about lower levels of mortality even with significant health inputs. The work of Preston and Haines (1991), described in Section 4.3 of Chapter III, suggests that maternal education is influential in relation to child health when there are significant health inputs for individuals to choose from, where these are known to them and where health determinants can be influenced at the individual level (e.g. by hand washing). The breakthrough period occurred at a time of increasing social commitment to education, as well as increasing levels of attainment. This may have affected the actions of the medical establishment and interest groups such that they were encouraged to advertise and explain health options and services more aggressively. To some degree this appears to have happened in relation to child nutrition in Fiji in the 1950s. This is an education effect at the community level.

Analysis of women's autonomy and status, net of educational attainment, is difficult in an historical context. The factors which are sometimes used to define relatively high autonomy have a decidedly modern ring: gainful employment; watch television or listen to the radio; go out regularly with husband (Basu, 1992). Dyson and Moore (1983) offer another definition which is also difficult to link to the social context of the early 1950s in Fiji: "autonomy indicates the ability -- technical, social and psychological -- to obtain information and to use it as the basis for making decisions about one's private concerns, and those of one's intimates." Fijian women, until the late 1960s, had little political power -- including the right to vote. Few worked in the cash economy. Modern communications were only beginning to emerge in the post-war period. However, the age of marriage was relatively late with a tolerance of loss of virginity, marriages were not typically arranged, divorce was possible, women could work in nursing and teaching and move freely around the country - all indicators which have been used to help measure autonomy (Caldwell, 1985). Women had played an important role even at the village level in the development of Child Welfare Work and their status was enhanced as a result in the eyes of the Government (MD1940). How these behaviours and attitudes might have translated into resources to maximise child health is something for which there is no evidence. Certainly women would have been

dependent on men for assistance in taking children to the available health services as well as calling out health care professionals. And if, as Caldwell asserts, "Female autonomy is greatest where both society and women themselves have little doubt about a woman's right to make decisions and to battle for her and her children's rights in the public arena" then it would have to be said that Fijian women lacked autonomy. It could not be said of Fiji as it was of Kerala and Sri Lanka, that these societies were "to a very considerable extent molded by the position of women (Caldwell, 1986)".

Perhaps the definitive opinion on Fijian women's autonomy is given by Ravuvu, 1983, as it applies even in today's world to many, especially rural, women:

The husband has considerable authority over his wife, who is expected to respect and obey him. The man makes final decisions about family or clan activities, and although women influence men to some extent in decision making, the man is the head of the house and has the final say...Females generally occupy a subordinate position in any family situation and in formal clan or tribal gatherings they expect to assume a lower position than males, from whom they normally sit apart.

[Women are] respected for displaying specific female qualities in accordance with the values and beliefs of the people ...

Politically the breakthrough period was neither democratic nor one in which the political will of individuals influenced the level of health services, conditions which Caldwell defines as facilitating breakthrough in other countries. The Colonial Government was in power throughout the period. The Fijian political context is well characterised by Ratu Penaia Ganilau (later Governor-General and first President of the Republic of Fiji), writing as Minister for Fijian Affairs and Local Government in 1967 about the previous decade:

The whole structure of Fijian Affairs administration was closely linked with the structure of authority in society ...Inherent in the whole philosophy of the Fijian Administration was a fundamental, unavoidable conflict of ideas between the traditional and modern principles of government. While modern democratic government is based upon the will of the majority, the Fijians were brought up in a tradition where seniority of descent conferred superior rights of exercising authority and of making decisions binding upon those younger or junior... it was accepted that the right to make binding decisions belonged to the few...The conflict of ideas between the two continued and became a source of friction in the Fijian body politic. Its call for resolution was finally thrown up

into sharp relief during the ten years under review [1957-66], when the effects of the new opportunities of the war years and other factors really began to make themselves felt...The conflict with tradition permeated all aspects of Fijian life -- social, political and economic (CP33/67).

He observed that the Spate and Burns reports had "set a new blueprint for future development".

This is a far different political context than that found in the three countries which Caldwell closely analysed, which he summarises as follows:

Social welfare programs, including massive extension of the education and health systems, were established in circumstances of close competition between parties of the center and left because of campaign promises during successive elections...the efficient health and education systems owed the attainment of their aims less to the central administrations than to local individual determination to secure promised and just rights.

Thus we can conclude that of the important social pre-conditions for a breakthrough in mortality as defined by Caldwell, (i.e. relatively high levels of education, relatively high levels of women's autonomy especially in terms of family decision making, and grass-roots democracy), only high levels of female education stand out as descriptive of the Fijians. Prior to and during the breakthrough period there were changes in the social context -- changes in attitudes resulting from greater international exposure, increasing urbanisation, better transport and communications. There may have been some change in standards of living, change which is unmeasurable or difficult to measure, as larger numbers of families entered the cash economy. And the experiences of the very large number of Fijian men serving in World War II and the smaller number in Malaya may have influenced attitudes both towards Western medicine and control over personal and child health. However, in relation to the massive health inputs these are likely to have played only a small part in the timing and extent of breakthrough, since they occurred throughout the post-war years. The political context, as it affected health inputs, remained one which was dominated by the colonial administration and Fijian custom.

6. Conclusion

In this section the timing and efficacy of the public health inputs, as well as other social factors, are evaluated in relation to their likely contribution to the "breakthrough" in childhood mortality.

As the aetiology of disease can be analysed in terms of multiple sufficient, even weakly sufficient, causes, so the contribution of different public health and medical inputs to reducing mortality from different diseases or conditions can be seen in terms of multiple weakly sufficient effects. This is in contrast to perceptions of disease causation which focus on single causes and which can be characterised by causal necessity (Kunitz, 1987). The underlying beliefs behind the programmes in the breakthrough period were basically eradicationist and characterised more by the spirit of causal necessity than the more ecological models of the 1980s (Mosley and Chen, 1984; Kunitz, 1987). The question here is whether the Fijian childhood mortality decline was the result of activist and intensive public health interventions in the shape of many largely "vertical" programmes aimed successively at specific diseases or whether it is more likely to have been the result of multiple weakly sufficient effects which might also include these.

The probable impact of the public health programmes can be assessed on a number of different dimensions. These include:

1. **The epidemiological significance of the disease.**

This would include direct and indirect effects e.g. measles depresses the immune system for some months following an active case.

2. **The efficacy of the intervention** including differences in the effectiveness of medical technologies. Thus, DPT vaccine, if the full dose is taken, offers complete protection against these diseases. In considering historical evidence, the degree to which the programme conforms to what is now known as best practice must also be considered. In this period in Fiji this would characterize the TB campaigns but not the filariasis campaign until the late 1960s.

3. **The effectiveness and/or coverage of the delivery.** The Fiji Government aimed at universal coverage as an ideal.

4. **The degree of compliance** required, that is the degree to which purposive behaviour on the part of the individual is necessary to achieve success. This is exemplified by the difference between the modification of attitudes and behaviours necessary to change the weaning diet and universal immunisation carried out in villages.

The overall contribution of a programme to the decline in morbidity and mortality will depend, of course, on the relative importance of the causes which it is trying to ameliorate. Its contribution to the breakthrough, as compared to the continuing mortality decline, will depend on its timing.

The (degree of programme coverage) linked with the (degree of compliance required) become particularly important as the range of effective health interventions becomes greater and as

they involve greater parental choice. As we have argued in the preceding chapter, the calculation of risk of a child's survival and the choice to act on these calculations will vary between individuals. The outcome of these calculations and the corresponding parental choices will depend on many factors of which mother's education is one. But as important, and an area which is relatively unresearched, is the contribution to rapid mortality declines of the survivorship of children of the least advantaged and the least motivated in the community. These children will include *inter alia* the children of the marginal, the incompetent, the unlucky, the permanently unhealthy and those who are simply poor parents. The children of these parents will remain, except in relation to "vertical" interventionist programmes, highly vulnerable. As mortality declines to very low rates - and where diseases are treatable and preventable -- deaths from children in these groups will begin to form a greater proportion of all deaths. The difficulty of capturing the least advantaged is, in part, what accounts for social status differentials in mortality which emerged in the U.S. over the early decades of the century (Preston and Haines, 1991) and which exist in developing countries today. The degree to which programmes reach the most vulnerable is important in the evaluation of these programmes. Some of the programmes initiated during the breakthrough period, such as the enhanced efforts to improve nutrition, are unlikely to have affected those most in need of them, while these same children will have been (perhaps forcibly) included in the immunisation programmes.

Table V-16
Summary of Timing and Effectiveness of Programmes and Campaigns

Year	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6
	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5

Disease-specific programmes

Enteric	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*
Smallpox	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*
TB	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*
Yaws	--	--	--	--	--	C*	C*									
DPT	P	P	P	P	P	P*	P*	P*	P*	P*	P*	P*	P*	C*	C*	C*
(Tetanus)																C*
Polio														C*	C*	C*
ID	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*
Filaria	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P

Other public health programmes

CWC	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*	C*
Nutrition	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Sanitation	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P*	P*
(Fijian)																

C* Highly Effective campaign

P* Programme with some probable effect

P Programme with little or unknown effect

Table V-16 lists the campaigns and programmes reviewed in previous sections and gives an admittedly subjective assessment of the probable effectiveness of these campaigns and programmes. There is no single programme that stands out as having the explanatory force in the mortality decline of, for example, malaria control and treatment in Sri Lanka immediately after World War II. Thus the probable effects of each programme must be assessed in relation to the others and in relation to changes in the social context.

It is useful to begin with Child Welfare Work because the delivery of most of the other programmes to children largely depended on its structure and efficacy. The organisation of Child Welfare Work, specifically through the agency of the District Nurses, conformed to what is seen today as best practice. The service was highly decentralised, the work was seen at the time as a priority, the aim was universal coverage even to remote areas, the nurses were well trained, and they had maternal and child health as a primary focus. The numbers of District Nurses and nursing stations substantially increased in the late 1940s and they increased over the breakthrough period. Thus geographic access to health care was increased with the important consequence that seriously ill children could more quickly and

easily have been seen by a health professional. However, the numbers of health professionals per capita did not increase in the breakthrough period and to some extent the increased numbers of District Nurses were replacing the former AMPS. The ability of the service to intervene quickly is dramatically illustrated by the smallpox vaccination campaign of 1960. The efficiency of the medical service is demonstrated by the number of programmes with which it was involved and the relative speed at which these were carried out.

The numbers of women receiving ante- and post-natal care increased over the 1940s, as did the proportions of attended and hospital births. While the positive contribution of attended births and ante-natal care to the decline in mortality is less significant for Fijians than for populations where perinatal mortality is very much higher, it would undoubtedly have contributed somewhat to lower infant mortality rates. This possible contribution is, however, put in perspective by the fact that the **neonatal** mortality rates averaged only 15 per thousand births between 1973-1975 (when these rates are again reported under the improved reporting system). This rate is exceptionally low in relation to other developing countries at about the same time (Rutstein, 1983). However this kind of care is likely to have boosted confidence in Western medical services.

The contribution of the health professionals in educating parents in the care of sick children -- even in the absence of specific drug therapies -- should not be minimized, but this had been ongoing since the 1930s. However, the effects of CWW would have begun to be felt after World War II as more nurses were put into the field, undoubtedly contributed to the mortality decline prior to breakthrough and would have continued throughout the breakthrough period. There is, however, no specific aspect of this programme which would explain a breakthrough period beginning about 1953.

The two other non-disease-specific public health programmes which might have affected child health -- sanitation and nutrition -- varied in their efficacy and in their probable impact. The lack of any overall authority over sanitation in the Fijian villages contributed to what was an apparent decline in standards and those programmes that were available through the Medical Department were apparently not generally taken up. However, it must be said that in relation to many developing

countries, then and today, the standards in Fijian villages would still be considered fairly high. Almost all villages had improved water supplies and latrines before the war, although it is suggested that these were not always fully maintained. The fact that such a large proportion of young men served in the military may also have influenced their personal cleanliness and enhanced the recognition of the importance of good sanitation. However, it is unlikely that improved sanitation made any substantial contribution to the mortality decline of the breakthrough period, which began almost a decade after the war.

The nutrition initiatives (which did not have the status of a programme or campaign) are difficult to evaluate. Their effects would largely have been in the better training of health professionals, on the importance of an age-appropriate diet and the elements of a balanced diet based on native foods. Although powdered milk became available over the period, its use in Fijian households does not appear to have been widespread based on early nutrition surveys (Parkinson, 1991b). There is no reported evidence that milk or other food supplements were given to women or children in the breakthrough period.⁶⁵ Changes in nutrition required a high level of individual compliance, especially in areas where foods supplementary to the traditional diet were not available. Again those living in the most rural areas and those less well motivated or less competent to understand the nutrition message were unlikely to have made significant dietary changes. Indeed, the weaning diet was perceived as the most common underlying cause of childhood mortality through the 1980s (Robertson, 1991). The effects of the nutrition initiatives, such as they were, would have occurred slowly with effects towards the end of the breakthrough period.

Although social factors, analysed in Section 5, undoubtedly played a part in the post-WWII mortality decline, there were few that would have contributed such specific effects as to influence a change in the rate of the mortality decline in the early-mid-1950s. The exceptions might be improved transportation and communications and the increased numbers living in or close to urban areas, with greater access to some types of medical care.⁶⁶ It has been suggested that changing attitudes, especially among men, might have had an effect on child health and illness control. This effect would have been felt shortly after WWII, with perhaps new impetus after the war

in Malaya, although far fewer men participated in this effort.

The disease-specific interventions differed in their effectiveness, their timing and whether they were new or continuing interventions. The smallpox and enteric fever programmes were effective on the dimensions outlined above. However, as they were continuing campaigns they would have had no effect on the timing of breakthrough. Enteric fever was not considered a significant cause of child mortality. The polio intervention and the campaign against neonatal tetanus were highly effective but occurred too late to have affected the breakthrough and in any event few Fijian deaths were the result of these diseases. The filariasis campaign, in the form of vector control, would have had its primary impact on the health of adults although it may have affected the prevalence of dengue. This work had little apparent effect on filariasis rates until the control campaign of the late 1960s.

For some important diseases there was no prevention or special treatment programme. This was the case for measles and respiratory diseases, especially pneumonia, in all probability a major cause of child deaths. The effective internationally supported campaigns against ARIs began in the 1980s with special training of health professionals within target communities, health education for parents, and the provision of antibiotics. This effort followed the recognition, at least in Africa, that childhood pneumonia was bacterial in origin (Ofosu-Amaah, 1991; Kirkwood, 1991a).

While increased attention was focused on infantile diarrhoea, the prevalence remained high throughout the period. Without ORT, treatment apparently required the seriously ill child to be brought to a medical centre. While there was some probable success from what was an effort to raise the consciousness of both medical professionals and parents, there are no data with which to evaluate these efforts. The programme required high compliance and is unlikely to have affected the most vulnerable -- including those in isolated areas and parents who were not well motivated.

DPT immunisations would have had limited impact until the late 1950s and then only in relation to the whooping cough (WC) epidemic of 1958-1959. The intervention was highly effective but required a high degree of compliance on the part of parents in the early years as the vaccine was largely confined to health

centres; there was no full-scale campaign until 1963.

Of the disease-specific campaigns, those against TB and yaws (related to children) were particularly effective and required minimal compliance; they were carried out throughout the country and the timing suggests their important contribution to the breakthrough.⁶⁷ These effects would have been both direct, as causes and contributors to morbidity and mortality, and indirect, especially in relation to increased interaction of children with health professionals and in the case of yaws the undoubted effects of penicillin on intercurrent infections. The effective treatments would also have enhanced the role of health professionals and the perceived effectiveness of modern health care.

Now let us return to look at the apparent changes in the effects of whooping cough and measles on mortality and ask whether these might offer clues about the causes of the breakthrough. The differences in the mortality rates in the epidemic years of the pre-breakthrough period and the breakthrough period are dramatic, although because of worsening vital registration these rates must also be considered in relation to the rates in the surrounding years (Figure V-6).

The substantial numbers of pertussis notifications in the late 1950s and early 1960s corroborate the limited evidence on numbers of immunisations in suggesting that the great majority of the child population were not immunised for pertussis. Yet in the years 1958-1959 there is no apparent increase in infant or child mortality in relation to the prior year, as had been the case in earlier epidemics (Figure V-6). This is partially explained by greater numbers of DPT immunisations. However, both the whooping cough epidemic years 1952 and 1955 saw increases in infant mortality, years with significantly fewer notifications than 1958-1959 (Table V-9A). Although the CMR also increases significantly in 1952, this is the last WC epidemic year that sees an increase in the CMR. While there is an increase in the IMR in 1962, another WC epidemic year, the increase is significantly smaller in relation to the prior year: the IMR increased by 46% over the previous year in 1955 but by only 23% in 1962. (The number of pertussis notifications in 1962 is larger than in any other year between 1950 and 1967.) Comparing these two epidemic years (Table V-9A) we see that **notifications** increased by 76% (the rate increased by 46%). Undoubtedly this

diminished effect of WC on the mortality rates was, in part, the result of DPT immunisations. However, in 1961 the DPT immunisation programme appears to have been centred in Vanua Levu and in Nadroga (MD1961) and in 1962 in the Lautoka area. Thus the great majority of infants in the Colony as a whole would not have been immunised. The large number of pertussis notifications confirm the partial DPT coverage.

Turning to measles, the epidemic of 1957 had no apparent effect on infant mortality. The child mortality rate increased significantly but within the context of a substantial decline from the early 1950s.⁶⁸ As argued above, this increase in child mortality, assuming as we are that it is largely due to measles, is probably the consequence of the build-up of a large number of susceptible children between 1946 and 1957. However, the mortality rate even in this epidemic year is low in contrast to that seen in 1946, allowing for poorer registration. The measles epidemic of 1963-1964 shows an increase in neither the CMR nor the IMR. The CMR in the 1967 measles epidemic year is the same level as in 1964, although up a little on the previous year.

It is possible that better treatment partially explains the decline in the volatility of these rates. However, there is no evidence that sulfonamides or antibiotics were routinely used either in the primary stages of the disease or for secondary consequences. It would be surprising if a dramatic change in treatment would have gone undocumented.⁶⁹

The probable explanation is that by the late 1950s there was a change in the health of children; in their resistance to diseases or in exposure. The timing of the breakthrough suggests that this change in underlying conditions began in the mid-1950s. This clearly points to the TB and yaws campaigns.

As described in Section 2, 1953 marked the beginning of a largely sustained decline in both the IMR and the CMR, at a pace that was faster than in previous years -- defining the breakthrough. The first wave of the BCG campaign ended in 1953, and the BCG immunisation programme continued, as we have seen, throughout the 1950s and 1960s. By the end of 1953 almost 2500 Fijian cases of tuberculosis had been removed from the community for treatment. Suspected cases were sent for examination and x-ray. The TB campaign was the most ambitious of the campaigns in the breakthrough period and grew in scope throughout that period.

The first year of the yaws campaign, 1955, also showed a

sharp decline in the CMR in relation to previous years. The CMR in this year declined by almost half. The IMR had shown a sharp decline in 1954 (50); 1955 was a WC epidemic year; the 1956 IMR was 48. The yaws campaign would have had a significant effect on many childhood infections other than yaws, as long-acting penicillin (PAM) was given in this and the next year to all Fijians. However, broad spectrum antibiotics have no effect on the course of whooping cough unless given within two weeks of the onset of the whoop (Morley, 1978), partly explaining the fact that the IMR increased in 1955 while the CMR sharply decreased, i.e. this difference is explained by the greater vulnerability of infants to WC.

The fact that the TB and yaws campaigns required minimal compliance on the part of individuals and reached the most disadvantaged members of the society adds strength to the explanation that they played a significant role in the breakthrough.

These two campaigns will have affected child health in the following ways:

1. Direct effects:

- a. reducing the number of children susceptible to TB by immunisation.
- b. reducing exposure to TB by removing active cases from the community and by treatment of less serious cases, thereby reducing the incidence of new cases among children.
- c. eradicating yaws, long known to be a source of childhood morbidity and, with intercurrent infections, a cause of mortality.

2. Indirect effects:

- a. treatment and removal of TB cases will also have removed some of those most vulnerable to other respiratory diseases and their spread.
- b. the antibiotic used in the yaws campaign will have had beneficial effects on other concurrent diseases.
- c. Both campaigns will have resulted in greater levels of health education and the enhanced prestige of modern medicine.

Since measles was not present in most years and WC was either not present or the epidemics were limited in many years, the contribution of the TB and yaws campaigns to breakthrough is only partially through these diseases. The fact that the mortality decline occurred both in infants and in older children suggests that changes in the causes of morbidity and mortality affected both age groups. The important causes of mortality for

which there was little apparent treatment throughout the breakthrough period were diarrhoeal and respiratory diseases. Diarrhoeal diseases are likely to have a greater impact on older children than on infants and significant changes in sanitation and water supplies have been ruled out. The apparent decline in the prevalence of pathogenic forms of dysentery prior to the breakthrough period could have affected the death rate from this disease. There were no major dysentery epidemics in this period, but incidence increased significantly in 1957 and 1962. Other than these years (years with epidemics of other childhood diseases) numbers were fairly constant until they declined to very low levels in the late 1960s. Taken together the arguments here suggest that there may have been a change in the prevalence and transmission of respiratory diseases.

Although speculative, the interruption in the synergism between diseases, especially tuberculosis but also possibly yaws, must be considered as one factor in bringing about the breakthrough. (This argument was discussed in Section 4.7.3.) The named infectious diseases, those against which campaigns were mounted, would have accounted for only a minority of child deaths -- yet mortality declined by almost half. This, combined with the decline in the volatility of mortality rates, suggests the possibility of an underlying change in the health of children which would occur when immunisation increases and exposure decreases to serious underlying causes of morbidity and mortality in the community. This argument has been made in relation to smallpox control in Europe (Aaby, 1992; Mercer, 1985; Mercer, 1990).

The yaws argument must remain highly speculative. The control programmes began on a large scale before there was detailed research on the relationships between yaws and other diseases, especially in children. A study in the mid-1950s suggests the degree to which colonial medical interest in yaws was related to adults in some geographic areas. A multi-country survey drew a response, which was not atypical of some medical officers, from a medical officer in the then Belgian Congo, "In Mayumbe, yaws is a notable cause of suffering but causes little economic loss as it occurs mostly in children (see Hackett, 1953)". This same report suggests that "malnutrition, malaria, ankylostomiasis, and other infections may influence the progress of the disease; it has been observed that concurrent treatment

of these conditions accelerates the cure of yaws." One country respondent [Mozambique] reports, "we are ourselves quite sure that *Treponema pertenue* [yaws] must behave in the same way as *T. pallidum* [syphilis]."

From the research here we cannot, of course, rule out the explanation that the breakthrough was the result of "multiple weakly sufficient" effects of the many concurrent public health efforts combined with other (unmeasurable) social factors, rather than the result of specific disease-related campaigns, but the evidence on timing does not suggest this.

What has been established is that there was a breakthrough in childhood mortality in this period and it brought mortality to a level which was low for developing countries, and is low for many countries even by today's standards. The "Route to Low Mortality" was a uniquely Fijian one building on the infrastructure which had been created by the joint efforts of the Colonial Government and the Fijians themselves through village committees and Fijian health professionals. But the breakthrough programmes reflected the eradicationist thinking of the day in relation to disease control and these programmes were pushed through in rapid succession by an activist Colonial Government.

Murray and Chen (1993) have suggested a "health assets" theory to explain sustained mortality declines. On this theory the momentum of the decline is a result of the build-up of "health stocks" rather than specific programmes -- these include physical and social assets e.g. sanitation and education, as well as a stable political environment in which these can be employed. The explanation of the breakthrough in Fiji would include the effects of the vertical programmes described above, but seen in the context of the health infrastructure which had built up over several decades. While this theory works to some degree for Fiji it gives insufficient importance to these shorter-term vertical programmes.

1. However, see Meegama (1968) and Kunstadter and Kunstadter (1990).
2. The Halstead Report and the Caldwell paper cited here analysed mortality at all ages, not simply childhood mortality.
3. China was largely excluded from the Caldwell analysis on the grounds that its lessons were different from those of "open" societies.
4. The infant mortality rate and the expectation of life at birth were the measures of health achievement. The World Bank's World Development Report 1984 was the data source except for Kerala, which was based on data in Krishnan (1985). Superior and poor achievement were defined as follows: "We have employed as our critical test for identifying superior health achievers an infant mortality rank at least 25 places above the country's per capita income rank, and that for identifying poor health achievers one at least 25 places below the income rank." (The ranking does not include countries with a population of less than a million, thus excluding Fiji.)
5. Costa Rica and Jamaica were exceptions among Caldwell's "superior" health achievers. Both had GNPs which were over twice the average of the non-oil producers in his analysis. The use of average GNPs (1982) to compare the superior and poor achievers amongst non-oil producing countries obscured the exceptions. However, both of these countries had GNPs less than a fifth of those of the oil producing countries amongst the poor health achievers.
6. The method of selecting these countries from among the 99 developing countries is described in Caldwell (1986).
7. The degree of imprecision is difficult to estimate without developing new models based on varying rates of decline. This is outside the scope of this thesis. Coale and Trussell (1977) in developing the method of time location used here, modeled mortality declines varying the annual rate of decline in mortality and found at the upper extreme of .06 an effect on the time to which the estimate applied of only .14 year. This, however, is based on a linear decline.
8. Consistent with the indirect estimates of CEB/CS from previous chapters, the estimates based on women 15-19 are not used and are not shown in the graphs.
9. There is no clear explanation for the fact that the estimates for the mid-1950s, based on the 1956 and 1966 censuses, do not "dove-tail". Older women, or the household respondent, may not always include children who lived for only a short time in numbers of CEB/CS. This will depress the estimate based on the older age groups in the 1966 census. However, the "flatness" of the 1956 estimates for the youngest three age groups suggests some problem in reporting of deaths or in age reporting. Again, however, it is likely that the estimate based on women 20-24 (q2) is too high.

10. Changing the breakthrough periods by a year or so and/or using indirect estimates from different censuses gives results approximately equal to those in Table V-2.

11. The direct estimate of q5 for 1975, based on the improved reporting system, was 55. Indirect estimates based on women 20-24 and 25-29 were 59 and 50 respectively. Therefore 55 is used as the estimate for 1975. There is a hiatus in reporting of deaths 1-5 in the late 1970s.

12. By the time the Ministry of Health system of vital registration was in place in 1974 infant mortality was relatively low. Neonatal mortality rates were about 15 o/oo and accounted for about half of deaths under 1.

13. Based on age distributions in the 1946 census.

14. The 1945 Medical Report notes in passing that Indian deaths are probably underregistered but this is not analysed.

15. The recorded Fijian infant mortality rates for the years 1940-1944 were 70,80,84,91,119.

16. In his history of Fiji, Lal (1992) describes Sukuna as "easily the most distinguished **taukei** (indigenous Fijian) leader of the twentieth century."

17. All of the former Colo provinces were incorporated into existing provinces. The provinces which remained were Cakaudrove, Bua, Macuata, Lau, Lomaiviti, Kadavu, Tailevu, Naitasiri, Ra, Rewa, Serua, Namosi, Nadroga and Ba (which then as now includes the Yasawa group).

18. For further description of the organisation of medical services in this period see the annual medical reports, but especially MD1945, 1950 and 1955; and the Buchanan Report (CP30/46).

19. The different missions of the different types of medical centres are partly described in MD1946. "The district hospitals have to be prepared to meet all emergency needs. The rural hospitals are designed to serve as clearing stations or buffer units to the district and general hospitals, and the rural dispensaries are essentially outpatient units with a few sick bay beds, destined to develop eventually into rural health centres."

The number of dispensaries increased to 35 in 1946 and to 41 in 1950 but included in this latter number are those at the Suva Gaol and Nadi Airport. The number increased to 46 by 1963.

20. These were Nurse Morrison's Maternity Home, Suva; The Methodist Mission Indian Women's Hospital, Ba; The Cottage Hospital, Ba; The Waiyevo Hospital, Taveuni.

21. A problem remains for analysts of these reports in distinguishing the numbers of locally trained nurses who are serving in the "districts" as public health nurses from those working as hospital nurses in the larger centres.

22. By 1946, 17 of these were Fiji-Indian AMPs.

23. The population density maps are based on the 1956 census. Between 1946 and 1956 the Fijian population grew by 26%, the total population by 33% and there was some increase in migration to urban areas. However, these maps are a good approximation of the population distribution in 1946. The location of dispensaries and hospitals is based on a 1945 map (MD1945) but these locations changed little in the 1940s and 1950s (see MD1950 and MD1955).

Dispensaries and hospitals in the outer islands are shown on Map 1.

24. The data in this section are drawn from government reports for all of these and later years; the tables and figures shown here, which are based on these data, are not always fully comparable. This is due in part to the fact that 1.) different aspects of the health service were reported on and evaluated in different years, reflecting the authors' style and interests; 2.) there is incomplete reporting for some years. Where possible, series have been taken up to 1966, the year of the census. In all cases the information in a table or figure has been assessed for all the years for which it was reported, even if the data are not shown here. Any particular anomalies in a series are noted in the text or in the endnotes. Much of the reporting during these years, atypically for government reports in Fiji before and later, does not include ethnic breakdowns. "Total population" in the text and tables means all ethnic groups; the total Fijian population is referred to as the "Fijian population"; and the population base for under fives is noted as appropriate.

25. A significantly upgraded hospital was opened in Savusavu in 1967, and was hailed as "a major landmark in Fiji's medical history" (MD1967), but there had been a rural hospital there for many years.

26. A major reorganisation of the Medical Service took place in 1965-66. Locally qualified doctors, formerly called Native Medical Practitioners, since 1950 Assistant Medical Practitioners, and since 1960 Assistant Medical Officers, were now designated as Medical Officers Class II and III. Recruits with fully registrable overseas qualifications became Medical Officers Class I, and provision was also made for promotion of outstanding locally qualified staff to MOI, which increasingly happened; by 1967, nine of the 19 MOI posts were filled by "locally appointed" doctors. For many years, "locally qualified" staff had gone overseas for post-graduate training, so that the earlier distinctions between "local" and "overseas" qualifications were progressively breaking down. Between 1965 and 1969 some posts were upgraded and new senior posts were created. In 1969 40 of the 53 MOIs were from Fiji.

The Table includes as "fully qualified doctors" those in posts graded as "Medical Officer" and above (before 1965) and those graded Medical Officer I and above (after 1965). NMPs, AMPs, AMOs, and MOs II and III, are counted as "locally qualified".

27. By 1969 only 2 of 97 Nursing Sister posts were held by expatriate staff.

28. The number of Fiji-Indian District Nurses increased slowly from 4 in 1955 to 10 in 1963.

29. The base is interpolated from the 1956 and 1966 census numbers.

30. In 1959, a domiciliary service was introduced "in an effort to combat the shortage of beds ... All women who have had their first child, but have had less than five and for whom no abnormality requiring hospital treatment has been discovered, living in suitable circumstances, both social and geographical, are now to be delivered at home by the staff, provided they have attended the ante-natal clinic (MD1959)."

31. This section is drawn primarily from Susan Parkinson's review "The Feeding of Infants and Young Children" (Parkinson, 1991b), my conversations with her and personal communications. Mrs. Parkinson has been a leading nutritionist in Fiji and the South Pacific since the mid-1950s.

*29a Antibiotics were available in the Colony from the mid-1940s, used especially in the treatment of TB. There is no suggestion of their wider use or of the wide use of sulfa drugs.

*30a The use of the term "epidemic" is inconsistent in these reports. A polio "epidemic" is reported in 1958 in which only 328 cases were notified. Very considerable increases in WC were not labelled epidemics. We have used "epidemic" in this analysis to include an increase of 50% or more in notifications. Some of these epidemics may have been local epidemics rather than colony-wide.

+31a Stanfield (1978) recommends temperatures of 2-10 degrees C.

32. In the immunisation campaign of 1964-1965, 141,564 DPT doses were given, of which 60,243 or 43% were first doses.

33. It is important to keep in mind the serious underregistration of these deaths when considering the level, as compared to the rate of change.

34. This was an extension to pre-school children of the campaign to immunize school children in 1963 against poliomyelitis and tetanus. The campaigns were supported by WHO and the United Nations Children's Fund, who also provided refrigerators for vaccine storage and insulated containers for transport (MD1964).

35. Reported infant deaths in 1966 numbered 465; based on the completeness of death reporting of about 45% shown in Chapter II, this number should be about 1033 and is used here. This procedure assumes that notifications are accurate, while death reporting is not.

36. These rates are taken from Bavadra et al. (1982), and checked against the original reports for a sample of years.

37. A pilot serological project amongst both Fijians and Fiji-Indians showed that yaws prevalence varied between 10% and 70% in different geographic areas and differed for the two ethnic groups (ethnic breakdowns not reported). Since it was concluded that "the majority of Fijians may be ... contacts", the entire Fijian population was treated (MD1955).

38. This assessment is based on disease notifications. In Kenya and Tanzania, 87% and 80% respectively of notifications were aged over 14 years.

39. Sources which investigate these indirect effects have not been found.

40. BCG stands for "bacille Calmette-Guerin" after the two Frenchmen who developed the vaccine in 1906 (American Medical Association, 1989). A positive tuberculin test means that infection had occurred at some time, not the presence of an active case; the negatives received BCG.

41. The point at age 3 in this series is the percent positive ages 0-5.

42. Examples from Wilson and Miles (1964): in a study of London hospital children (1932) reacting to a 1/100 dilution of Old Tuberculin at ages 3-5 about 15% were positive, at ages 6-10 this reached about 30%; in a study of Philadelphia school children (1934) in an urban area, between 45 and 50% were positive in ages 4-5; and in ages 6 and 8, between 55 to 70 %. These estimates are approximate as data are presented graphically.

A Danish study (1959) cited in the same work shows that among unvaccinated subjects in the period 1950-1952 tested with 10 T.U. 39% of those 15-24 and 80% of those 45-54 were positive reactors.

43. At younger ages, 13.6% of those under 1 and 44.0% of those 1-2 were positive reactors.

44. The size of the Mantoux reactions was measured on a scale that differs from that which has typically been used (See Udani and Maddocks, 1978). Positive reactors were graded on the following scale: +1 to indicate an area of oedema 5mm. and below 10mm; +2 -- 10mm. and below 20mm; +3 -- 20mm. and over; +4 -- "oedema and vesication or ulceration" (MD1950).

45. Based on Registrar-General's reported numbers under 5 for 1950, and Tables V-10 and V-11.

46. See note 37.

47. The use of INH (Isoniazid) was probably relatively limited before 1959 as trials were then taking place in the villages to assess the problems in supervising its use.

48. The "hospital morbidity" numbers reported by Bavadra et al. (1982) have been used here. For most years they either match or are close to the "notifications". There is confusion in the medical reports over the use of the terms "notified", "registered", and "hospital cases".

After 1964 the percentage bacteriologically positive (BP) of new cases in a year were reliably reported (reports before that were judged to be inaccurate - MD1965). About half the cases were BP depending on the age distribution in a given year. In 1965 12% of cases 0-5 were BP in contrast to 44% of those 15-24.

49. The 1961 Medical Report includes an analysis of new cases by age and race; 81% of cases 5 and under were Fijians.

50. A minority of admissions were re-admissions. The 1961 Medical Report shows that these were fewer than one fifth.

51. Recent research has made the use of BCG somewhat controversial; although it was the WHO recommended approach to TB prevention during the period in Fiji's history which is analysed here (Rodrigues, 1991; MD1964). The protection rates have been shown to vary in different populations, and it "prevents mainly the closed forms of the disease" such as meningitis (Rodrigues, 1991). Thus case-finding and cure remain essential and these were an important part of the Fiji programmes.

52. In calculating the rates shown in this table, the number of children under 2 years (from the Registrar General's annual reports) is used as the population base. Several studies show that the incidence of diarrhoea is greatest for children under 2 years. These studies are reviewed by Kirkwood (1991b) who notes "that the exact shape and timing of the peak [of the incidence curves by age] varies" across studies. The Machakos Project, Kenya, (Leeuwenburg et. al., 1984) reports average 2-week incidence rates (% of age group in months) as follows:

0-5	6-11	12-23	24-35	36-59
15.8	24.5	15.9	7.4	3.7

Re-analysis of these Kenyan data (Table 1 *op.cit.*) shows that 72% of episodes occurred to children under age 2. Severity of episodes has also been shown to be associated with age. De Zoysa and Feachem (1985) estimate that 80% of diarrhoeal deaths occur to children under 2 years. Osuhor and Etta (1980, Zaria, Nigeria) reviewed by Kirkwood (1991) report that 18% of infant attendances at a child welfare clinic were the result of gastroenteritis in contrast to 3% of those of children ages 3-4, and the number of clinic visits in the older age group was a quarter to a fifth of those for the younger age group.

53. This is the only report on this inquiry in the Medical Department Reports.

54. These studies reviewed by Kirkwood (1991b) are the Machakos study in Kenya and the Chingale study in Malawi.

55. More recent medical opinion suggests that typhoid vaccine is "comparatively unsatisfactory" (Mims, 1987). The effectiveness of the vaccine in Fiji in this period would have been confounded with the effects of sanitation campaigns.

56. Although all prevalence surveys had shown significant geographic variation, the 1970 surveys, which covered much of the country, showed infection rates as varied as 32% on Malolo Island in the Mamanucas and 25% in one Kadavu village to 2 percent in one of the islands of the Yasawas (1970).

57. The 1967 Medical Report reported that filariasis was endemic in some of the wetter areas of Fiji. A 1957-1959 survey in Rewa showed a microfilarial rate of 12.2%. An earlier survey (MD1956) on Vanuabalavu island showed a rate of 21.5%, including cases with clinical signs only.

58. The dose was 5 mg. of diethylcarbamazine per kg. body weight for 28 doses.

59. Of the notified cases, 84% occurred to Fijians, Rotumans or other Pacific Islanders living in Fiji.

60. The Suva suburbs are included here for comparability with later censuses.

61. The census questions differed in the way they assessed what proportion of Fijians lived away from the village in which they had traditional ties.

62. In the age group 30-44 "Entertainment and Personal Service" increased from 9 to 15; "Other Service" increased from 22 to 37. Similar increases occurred amongst men 20-29.

63. See Lal (1992), however, who takes the view that the "loss of productive time in a period of rapid change" brought significant social and economic costs to the Fijians.

64. The 1956 Census did not include questions on education.

65. Exceptionally, the 1964 Medical Report notes that skimmed milk supplies were received from the U.S. aid agency, and given to children and to pregnant and lactating women. There is no discussion or evaluation of this effort.

66. This might include more rapid treatment of respiratory infections and severe diarrhoea.

67. The TB campaigns for adults required a high degree of compliance.

68. The CMR rates for 1954, 1955, 1956, 1957, 1958, 1959 (the latter two years were WC epidemic years) were 11.0, 6.8, 6.6, 10.0, 6.6, 5.9.

69. CMO Gurd wrote a comprehensive and historical medical report in 1969 outlining some of the more successful medical programmes, on the "eve of independence"; the use of antibiotics is not reported except as noted here.

CHAPTER VI

POSTSCRIPT AND CONCLUSION

1. Introduction

Fiji became independent on October 9, 1970. In his first speech as Prime Minister of the Dominion of Fiji, Ratu Sir Kamisese Mara underscored the wish for continuity with the colonial past,

We became dependent in a warm spirit of friendliness and trust and we become independent in the same warm spirit ... Nothing that is happening today can change the warm feelings of our people for the Crown, the United Kingdom and its people.

Although there would be inter-ethnic political strife for the next two decades, the aspiration was a multi-ethnic society and this spirit especially pervaded the health and social services.

The core analysis of this thesis covers the colonial period. Characterising government in the period between 1970 and the 1987 military coup which transformed the political context, Lal (1992) writes

Caution, continuity, and continued links with the colonial past rather than fundamental change in new directions would be the hallmark of the post-colonial years.

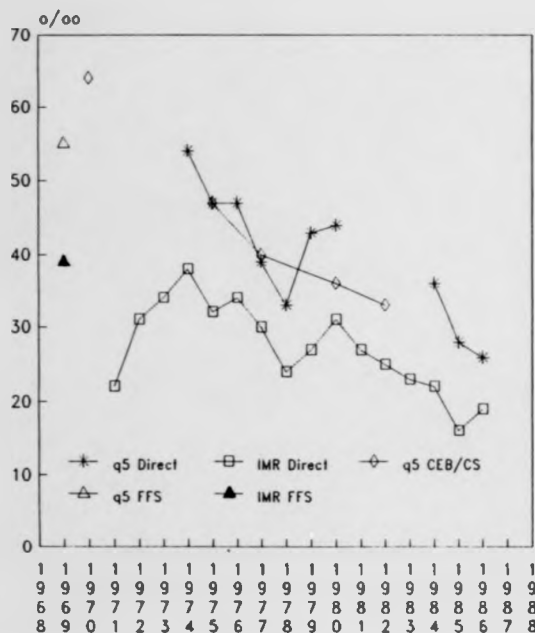
The health of the Fijian population, in contrast to other ethnic groups, as a special colonial concern ended with independence, however, and probably some years before. This is not to say that there were not substantial differences in child health between the two major component groups; there were and are differences in the age pattern of mortality and in the causes of early childhood deaths.

This chapter is a "postscript" to the more detailed analysis, briefly outlining levels of mortality and health care provision from independence to the last census in 1986, the year before the military coup. This comprises section 2. Section 3 is the conclusion to the thesis as a whole.

2. Postscript

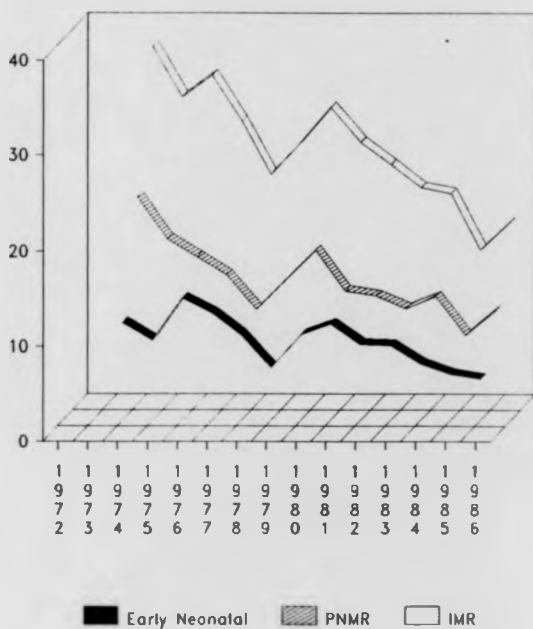
Figure VI-1 shows direct and indirect estimates of childhood mortality for the post-independence period. By 1974 the Ministry of Health (MOH) system of recording births and deaths was fully in place. The difference in completeness as between this system and the Registrar-General accounts for what appears to be an apparent rise in infant mortality in the early 1970s,

Figure VI-1 Childhood Mortality 1970-1986
Indirect and Direct Estimates
Fijians



See text for derivation of estimates

Figure VI-2 Early Neonatal and Postneonatal
Mortality
Fijians 1974-1986



Sources: Robertson et al, 1990, Ministry
of Health Annual Reports.

as the new system was implemented over time (see also Figure II-1 in Chapter II). The 1973-1974 average IMR, based on MOH data, was 36; this accorded well with the estimated IMR from the 1974 Fiji Fertility Survey (FFS) of 37, based on births in the five years prior to the Survey. The direct estimates of infant mortality suggest that there was no consistent decline in the IMR again until the early 1980s. The indirect estimate of q5 for 1970 based on women ages 30-35 in the 1976 census is 64. The second series of indirect measurements of q5 is based on the 1986 census (excluding women 15-19). Direct estimates based on Ministry of Health reports are also shown.¹ The correspondence in these estimates suggests a relatively high level of registration of vital events.

The decline in the IMR in the 1980s is, in part, explained by the declining early neonatal mortality rate (deaths in the first week of life of those born alive) resulting from new medical expertise and technology in the country (Figure VI-2). The first consultant pediatrician, Dr. Amparo Adiao, arrived in 1974 to join the staff of CWM, but with a broad range of responsibilities for child health. Her interest in and care of low birth weight babies was to have a considerable effect on infant mortality, more so for Fiji-Indian babies though it affected Fijians as well.² As Figure VI-2 shows, Fijian post-neonatal mortality also declined in this period, but it is early neonatal mortality that is the most difficult to affect because of the need for intensive medical intervention. This shows a decline to a low rate by 1986.

2.1 Medical provision

Post-independence medical provision remained high, as shown in Table VI-1. Perhaps the most important indicator (Caldwell, 1986) is the number of nurses per 1000 population. This had risen to 2.0 by 1986. While there were 120 nursing stations and 43 larger Health Centres in 1966 for the total population, in 1986 there were 95 and 53 respectively. In the intervening years the health system had been reorganised. Health centres provided a more comprehensive health service, including in-patient care, while nursing stations remained the smallest primary care unit. As transportation improved, older and smaller centres were closed. Four Divisional Hospitals were created to relieve the load on the CWM.

Table VI-1
Medical Provision, 1966-1984

	1966	-70	-72	-74	-76	-80	-84	-87
A	.36	.46	.39	.41	.48		.41	.4
B	1.3	1.5	1.8	2.0	2.1		2.1	2.0
C		62	74	81	81	87	88	89
D		1.2	1.1	1.2	1.0	1.2	1.1	1.1
E	1.5	2.0	2.0	2.1			3.1	
F	120				83	90		
G	43		45	45		54	47	53

- A. Doctors per 1000 population, all races. (Private doctors excluded. If included, they would bring the ratio to .40 in 1966 and to .55 in 1984.)
 B. Nurses per 1000 population, all races.
 C. Percentage of births in hospital; Fijians.
 D. Antenatal "first visits"/births: Fijians.
 E. Outpatient attendances per population: Fijians.
 F. Nursing stations
 G. Health centres.

Sources: Medical Reports; Report on Social Indicators, 1977.

In relation to Maternal and Child Health little changed in respect of policy from that outlined in the 1969 report:

The district nurse is given an area of responsibility which she can come to know and which she can get around without difficulty once a month or so...the policy is that in rural areas there should be one to every 2000 to 3000 people and in towns 1 to every 10000 or so...she knows what children have been born and what immunisations are due...delivers babies, dresses cuts, advises on baby care, visits schools, chides, comforts and observes...[she] is the corner stone of the Medical Department's entire architecture (MD1969).

By 1986 90% of births took place in medical centres and virtually all women had a first antenatal visit.³

2.2 Mortality Differentials

The 1974 FFS and the 1976 and 1986 censuses provide the first data with which to explore mortality differentials, apart from provincial differentials at the beginning of the century. Although the analysis of these individual level data is outside of scope of this thesis, two factors have played a significant part in the preceding analysis -- education and urban/rural place of residence. Is it likely that differentials in these have played a significant part in the mortality decline?

2.2.1 Education and Place of Residence

It is now well established that maternal education is negatively correlated with childhood mortality and that the effects are often large (Cleland and van Ginneken, 1988, and Cleland, 1990). Throughout this analysis it has been assumed that these effects would be relatively small amongst Fijian women. Indeed, the FFS confirms this (Table VI-2). There are few women with no or very little education in the sample (7%). It is only amongst women with a secondary education or higher that the effects on mortality are apparent; their numbers were proportionately few in the FFS and would have been much fewer in earlier periods. In any case the differentials are relatively small.

Table VI-2

Differentials in Childhood Mortality (Education and Place of Residence)
FFS Fijians¹ (qx * 1,000)

A. Years of Schooling			
	0-3	4-8	9+
q1	27 ²	29	24
q5	43 (11/262)	57 (172/3272)	48 (19/412)

B. Place of Residence			
	Suva	Other Urban	Rural
q1	19	39	42
q5	24 ² (10/423)	52 (26/540)	60 (165/2875)

1 Based on births between 1963 and 1972; numbers of deaths/births ().

2 Note small numbers

Univariate analysis of differentials in mortality by urban/rural residence can mask other relationships, e.g. the differential movement of the better educated to urban areas and age differences in migration. However, for this analysis place of residence has been important. Mortality differentials by urban/rural residence or by geographical area (Division) might suggest differential provision of health facilities. The FFS (Table VI-2) suggests that the rural/urban differentials were only significant in the mid-late 1960s as between Suva and the rest of the country. Urban Nadi and Lautoka on the Western side

of Viti Levu were still relatively small towns in the ten years prior to the Survey.

The 1986 census suggests relatively small rural differentials by Division, although Eastern Rural estimates are the lowest rural estimates (representing Lau), as they have been for a century.⁴ The urban/rural differentials are surprisingly large for the Western and Central Divisions -- in both areas there is a Divisional hospital in the urban area. But these differences will, in part, reflect the differences in socioeconomic background of the urban women.

Table VI-3

Differentials in Childhood Mortality by Place of Residence (1980)
CEB/CS (North): 1986 Census.

Division	Rural/urban	q5	Numbers CEB/CS*	SE
Western	Rural	45	(6549/6258)	2.5
Western	Urban	25	(2967/2893)	2.9
Central	Rural	39	(6027/5795)	2.5
Central	Urban	27	(7659/7456)	1.8
Northern	Rural	41	(5121/4912)	2.8
Eastern	Rural	36	(3771/3636)	3.0

*Source: 1986 Fiji census births to women ages 30-34.
Northern Urban excluded, N deaths = 8.

Overall, mortality was relatively low throughout Fiji by 1986, reflecting the commitment of the Government before and after independence to a decentralised health service. However these data suggest a probable combined advantage of urban place of residence and higher socioeconomic status. But there is probably an urban advantage in child mortality independent of socioeconomic status. By 1986 one in three Fijians lived in urban areas (Chandra (1989)). These are areas characterised by good and inexpensive transportation services which, even where health services are decentralised, will allow easier access to medical care. And there is a good national newspaper which devotes considerable space to health and nutrition. This is likely to be more accessible to urban dwellers.

These possible differentials will have become important to the overall trends in mortality in the relatively recent past, as the two main urban areas have become centres for education, industry and government.

3. Conclusion

The aim of this thesis was to measure the trends and levels in Fijian childhood mortality from the time of cession in 1874 to the most recent census in 1986. Having done so, explanations were to be sought and evaluated, especially in terms of the type and efficacy of Colonial Government public health programmes, and the response of the Fijian people to them. Methodologically, then, the aim has been to combine demographic analysis with the documentary evidence with which to interpret it. Unlike many developed countries there are neither long series of quantitative data to explain trends, for example indexes of food prices, nor are there many social histories which can contribute to explanations of demographic change. And importantly, unlike developed countries, there is no record of causes of death by age and ethnicity for any part of this period, although there is good evidence of the diseases present in any year.

Therefore, while the aim was an explanation of changing levels of childhood mortality over the century, an underlying question was how far the types of evidence that are likely to be available in developing countries can take us towards explanations of change.

The data proved surprisingly rich. A relatively complete series of rates for infant and child mortality, and for some periods neonatal mortality, was found from the last decades of the 19th century to post-independence Fiji, with a break of only a few years around World War I. A long series of indirect estimates, starting in the mid-1930s, was used to supplement vital registration data and to give reliable estimates of mortality levels.

Annual reports from the Government Medical and other Departments provided considerable documentary evidence and for some periods the writings of anthropologists and the memoirs of officials provided additional evidence.

The unusual abundance of the data was not unconnected with the nature of government policy. From the outset of colonial rule (and the accompanying devastating measles epidemic) the Government had been preoccupied with the problem of how to arrest the perceived and rapid "decrease in the native population". The Commission set up in 1893 to inquire into this produced a long report remarkable for the breadth of its analysis, and prescient in many of its recommendations. This report provided a detailed

analysis of many of the factors which today would be included in any explanatory framework of childhood mortality -- including the status of women, care of women during pregnancy, breastfeeding practices, the weaning diet. Childhood, and especially infant, mortality was seen as a key to halting the population decline, and measures designed to reduce mortality were central to government policy over the decades that followed. As a result these indicators were keenly monitored. The health of the native population, and especially of its children, assumed an importance which was perhaps rare in colonial history. The experienced Chief Medical Officer in the last year before Fiji's independence wrote:

In most Colonial territories the history of the health services has undergone three stages of development. Western medicine was first introduced for the benefit of the European community and no concern was felt for the health of the original inhabitants. Then, either because it was realised that surrounding ill health and lack of hygiene could affect the European community or because of the interest of the Medical staff, some attention began to be paid to the native population; but this was definitely allocated a lesser priority and the facilities were usually poor. It was only in the later stages of development that modern medical facilities were extended to the community at large and that the whole range of public health was spread throughout the country.

Fiji was an exception to this pattern.

The Medical Department was...established in Fiji shortly after cession ... and it commenced its work by tending for the "natives" as a matter of priority (Gurd, MD1969).

Writing on "Medicine and Colonialism", Arnold (1992) argues,

It was late in the colonial day before Western medicine began to turn its attention to problems of poverty and malnutrition, rural hygiene and sanitation, and women's and children's health -- in short, to see medicine in terms of public health rather than the narrow priorities of the colonial state. Even then, Western medicine might be very thinly spread. On the eve of Britain's departure from India in 1947, there was only one registered doctor (of Western medicine) for 6,300 people and only one nurse for every 43,000...Many African and South-East Asian colonies were as badly or even worse off when independence came.

Again, Fiji was an exception.

In the early years of the 20th century, the Government concentrated on building up a medical infrastructure, an important feature of which was the development of a cadre of locally trained "Native Medical Practitioners", followed by "Native Obstetric Nurses". By 1910, a large proportion of the

Fijian population had some contact with a medical professional. This was coupled with public health policies, notably the improvement of sanitation, water supplies and housing, which were felt to be within the control of the Government and likely to have immediate effects on mortality. Too much was perhaps attempted too fast; there was resistance in the Fijian villages. The sanitary improvements were not maintained, and the obstetric nurses were at first ignored. But the Government persisted, and lessons were learned about the importance of securing the active support of the local Fijian administrative leadership.

By the mid-1920s, infant mortality had declined by half from the highs of the late 1890s to about 150. But spikes continued in epidemic years, and there was little effective medical response to the main immediate causes of death among children, respiratory, diarrhoeal and infectious diseases. However, when new medical technologies did become available, the Government was proactive in using them, as for example in the campaigns against hookworm and yaws. For their part the Fijians were willing to try them when they were shown to be effective, as was the case with yaws treatment.

In the post-World War I period the fear of absolute decline in the Fijian population had all but disappeared. However, the need to reduce Fijian childhood mortality remained a dominant public health objective, inspired now by a new concern, shared by the Government and the Fijians, of a proportionate decline as a result of the faster rate of growth of the Fiji-Indian population. Fijian childhood mortality was judged as too high in comparison with that of the Fiji-Indians (though in fact the latter was almost certainly underestimated).

A new, and in many ways startlingly modern, emphasis was given to public health initiatives in the late 1920s under the aegis of the Child Welfare Campaign. The programmes associated with the Campaign were aimed at changing the behaviour of women by bringing to them, in their villages, the basic principles of maternal and child health -- by preaching, leafletting and example. Women's committees were formed by high status local women, supported energetically by district nurse successors to the NOBNs (now accepted). The Campaign undoubtedly improved general hygiene, the survival rate of the new-born, the outward appearance of children, and sanitation (though it seems to have had little impact on dietary habits), but its overall impact on

mortality was disappointing. Whereas the Neonatal Mortality Rate declined sharply between 1928 and 1939, there was no decline in the CMR in the face of repeated epidemics.

As with a small number of other countries which achieved low mortality with little economic development, the Fijian route to low childhood mortality accelerated in the early 1950s. The decline in childhood mortality went from an average of under 2% a year between 1940 and the early 1950s to 4% between 1953 and 1965. This "breakthrough period", a period of rapid decline in childhood mortality, lasted for twelve years. A close analysis of the likely causes of the change in the rate of decline makes it possible to eliminate those likely to have small or no effects and to evaluate the others. There was no evidence that rapid economic development or social change played a significant part. Educational levels, always quite high, had not changed; and these effects are likely to be lagged, in any event. Though the Government persisted in its public health programmes, it complained about sanitation conditions throughout this period. Deficiencies in the weaning diet were still reported.

But new medical technologies were becoming available, and the medical services were, in the early 1950s, in a strong position to take advantage of them. The Fijians resisted moves to concentrate medical facilities. Under post-World War II pressure from outside advisers to centralise and modernise its health service the newly emerging Fijian leadership insisted that it retain its fundamental character of combining decentralised health centres with village-based delivery of care. Two campaigns, against yaws, using penicillin to eradicate it totally, and against tuberculosis, were particularly effective and universal. It is argued that the timing of these two campaigns suggest that they played a significant part in bringing about the mortality decline in this period. Their effects will have increased resistance and exposure to other diseases. Epidemics of whooping cough and measles, for example, did not have the same consequences for mortality as in previous years. The spikes in mortality rates, apparent in earlier periods, began to smooth out. It is hypothesised that the synergism between diseases, especially between TB and other diseases, was interrupted.

Sustained public health initiatives over many years, involving both the Colonial Government and the Fijian people

themselves through village committees and local health professionals, had contributed to the endemic mortality decline, and had laid the foundations for the breakthrough. However, the breakthrough itself -- the rapid acceleration of the rate of mortality decline -- was brought about by determined and highly organised specific campaigns, which were not the result of populist demand, but a product of long-standing interventionist policies applying new technologies when these came to hand. The campaigns were essentially eradicationist, and derived from a long historical commitment to use the power and resources of the state to enforce the health of Fijian children.

Stephen Kunitz (1990) has recently written:

particularistic disaggregation is...critical in the analysis of mortality in colonial cultures. Commonly analysts use measures of GNP per capita, mean educational achievement of mother, and other variables in multiple regression in which the units of analysis are entire nations. More can be learned by examining socio-cultural factors: both the culture of the colonizers and the colonized.

The work for this thesis has been carried out in this particularist spirit. What does this particularisation show us? Among other things,

(i) There was a close and functional working relationship between the Colonial Government and the traditional Fijian administration. The Government administered the public health initiatives and reforms, though they were for the most part paid for by local taxation prior to World War II.

(ii) The mortality decline occurred throughout the century. Where analyses of mortality declines in developing countries focus only on post-WWII declines, they will give an exaggerated picture of the importance of medical technology, although its effects should not be minimised.

(iii) The major causes of the mortality decline vary from one period to the other. Thus, for example, sanitation is particularly important in the first decades of the century. This is a reminder that the debate about causes of mortality declines needs to focus closely on particular periods. Sanitation appears to have remained unimproved in the breakthrough period when health technology was important.

(iv) The impact of public health initiatives, medical technologies and changing standards of living can be profitably explored even without data on cause of death, though the

arguments, often by elimination, are necessarily weaker.

(v) The role of the medically trained (such as the Fijian NMPs) in preventive care is important in reducing child mortality, even without access to new medical technologies.

(vi) However, even innovative programmes, such as the CWC, had little power against highly pathogenic diseases, in the absence of modern medicines.

(vii) Where births are well-spaced and low birth weight babies are uncommon, preventive health care can lead to a decline in neonatal mortality that may precede, by a considerable time, the rapid decline in child mortality.

(viii) The age-pattern of childhood mortality remained much the same throughout the decline, with child mortality staying high relative to infant mortality. This strengthens the argument that there is no one pattern of mortality decline.

(ix) Strong cross-sectional associations between socio-cultural variables, such as maternal education, may not be reproduced over time, especially where there is relatively high literacy.

(x) The conservative culture of the Fijians played a significant part in the mortality decline. Political change occurred relatively slowly and many beneficial customs were slow to change (e.g. birth intervals and breast feeding). The Fijian culture is not individualistic and this created a context in which pressure for conformity to public health initiatives could be effectively applied.

(xi) The Caldwell model is not a universal route to low mortality. The decline in mortality in Fiji took place in a context of traditional authority and relatively limited autonomy for women.

(xii) Much of what we characterise as modern approaches to public health -- concern with maternal and child health, sanitation, equal access to health care, child nutrition -- characterised at least one colonial setting for over a century.

What are the problems in undertaking such a particularist analysis, especially an historical analysis in a developing country?

(a) The range of documentary materials which can be found has been limited, although further research may yield more. But the resources to store and maintain these documents in often hostile environments are scarce. They are and will be difficult

to find. Thus there is over-reliance on Government reports which survive elsewhere. As long as these are written from different perspectives and with different evidence (e.g. the Medical, Fijian Affairs and Registrar-General's Departments), this is acceptable. But in other contexts this may not be the case. However, in recent years in Fiji the Ministry of Health is also the source of mortality data, and although these are still the best data, there is the potential for their completeness to be unquestioned.

(b) Defining significant historical periods is difficult without an initial research base to provide points of reference. In this analysis, for example, the period covered in Chapter III is not defined by any particular events or characteristics: it is just the time between the O'Brien years and the CWC. This stretches the analysis to considerable thinness. If further documentary evidence is found this may be divided into two or three distinct periods for interpretation of the mortality decline.

(c) Recent research in the U.K. on the mortality decline (Woods and Woodward, 1984, Landers, 1992, Galley, 1994), demonstrates the importance of examining geographic patterns. This analysis suggests that spatial analysis is important even in such a small country as Fiji, but the existing evidence and the small numbers are likely to preclude extended analyses. It may remain an unanswered question why Lau appears to have had consistently lower mortality than the rest of Fiji, despite its unfavourable geographic setting for health care delivery.

Despite these methodological constraints, this analysis suggests, as do other case studies, that there is considerable need and potential for particularist analysis of trends and levels in mortality in developing countries which combine demographic and more qualitative documentary evidence.

1. The Bavadra estimates are used here for the years 1974-1980 (Bavadra et al., 1982), as the reported series of child deaths is incomplete and the method otherwise used here requires six consecutive years of reporting. The Bavadra series ends in 1980, and there is therefore a hiatus in the early 1980s.

2. The incidence of low birth weight babies (<2500g) in 1975 was 4.5% amongst Fijian births while amongst Fiji-Indians it was 22.9% (Johnson, 1981). The perinatal mortality rate amongst Fiji-Indians fell from 43.8 in 1974 to 17.5 in 1986.

3. The most likely explanation for this number exceeding one per birth is poor record keeping. However, some pregnancies will not end in a live birth.

4. An approximate estimate of the standard errors (SE) for these estimates is the SE of the proportion of survivors/births. This is shown x 1000 as is q5.

APPENDIX A
CENSUS QUESTIONS ON CHILDREN EVER BORN AND SURVIVING OR DEAD

The 1946, 1956, 1966, 1976 and 1986 censuses of Fiji have each included questions on number of children ever born and surviving. The form of these questions has differed in all four censuses, as have the interviewer/enumerator instructions and the format of the census form for recording responses.

The 1946 census sought the following information from "legally married women who had reached the age of 13 years or over": "If a married woman, state total number of children born alive and the number of such children who are now dead."

In 1956 the informants were asked to report for each female 15 years or older, and the enumerators to record, the "Total number of children" in two columns "Living" and "Dead". The total children ever born was derived from these numbers. Some enumerators recorded the total born instead of the total living. Where only one entry was made, it was assumed that this was the total born. Women who had borne more than 8 children were recorded as having had 9+ children. (McArthur, 1958; Zwart, 1968)

In 1966, the schedule required the enumerators to record "Total number of children" in two columns "Born" and "Still living", again for all females over age 14. The instructions prescribed that "Born" meant "The total number of children born to her including any who may be dead or who died as soon as they were born" and "Still living" meant "The number of children born to her who are still living."

The 1976 schedule asked two questions of all females 15 and older: Q17 "How many children has this woman borne alive?"; Q18 "How many of the children borne are still alive?" The enumerator instructions included "A child borne alive is one who cries after being born" and "Be careful to include very young babies who may have been born immediately before midnight on census night." The instructions on the census form included "Write number of boys and girls. If none write 0."

The 1986 schedule added a further question about children ever born who were not living in the household on census night. Volume 4 of the 1986 census report notes that "The information on children ever born has been indirectly derived from Questions 18-20. This approach has never been attempted before. Previously this information was derived directly just by asking females how many children they have had in their lifetime. By asking these questions there is a better chance of including everyone, especially those that are most likely to be missed by the previous approach, namely children that have left the household."

The questions in the 1986 census were as follows:

Q18 "How many of the children this woman has borne alive were here on census night?"

Q19 "How many were elsewhere?"

Q20 "How many have died?"

Q21 "When was the last child born?"

Q22 "Is the child still alive?"

Enumerators were instructed to record 0 "if none" and boxes were provided to record boys and girls separately.

APPENDIX B

AN EVALUATION OF THE DATA ON CHILDREN EVER BORN AND CHILDREN DEAD FROM THE 1946, 1956, 1966 AND 1976 CENSUSES USED IN THE BRASS METHOD FOR ESTIMATING CHILDHOOD MORTALITY.

Questions on children ever born (CEB) and children dead or still living (CD or SL) were asked in both the 1946 and 1956 censuses, well before the work of Brass on the indirect estimation of childhood mortality based on these questions (Brass et al., 1968). The questions differed in the two censuses, as did the coverage and the coding of responses. Similar questions were asked in the 1966 census; the report was published prior to Brass et al., 1968. These questions were also asked in the 1976 and 1986 censuses; the wording changed slightly in each of them (see Appendix A).

To use the CEB/CD or SL published data from the 1946 and 1956 censuses for the estimation of early childhood mortality, correction factors must be estimated in both cases. Use of the data from the 1966 and 1976 censuses involves only an estimate of the average number of children born to women who have had 15+ children.

Looking first at the 1946 census: the Brass method requires that all women, not just ever married women, and their children in each five year age group be included in the average parities and the average numbers still living or dead. The ratios of the average parities of women 15-19 and 20-24 (i.e. P_1/P_2) and women 20-24 and 25-29 (i.e. P_2/P_3) -- in the Trussell variant of the Brass method used here -- also determine the multipliers used in the conversion of the proportions dead into estimates of the probability of dying and the determination of the reference period to which mortality estimates apply. Since only ever married women were asked the fertility questions in the 1946 census, the data on CEB/CD must be corrected to include all women and their children. This is easily done with the denominator of the averages by simply including never married women. It can be assumed that for Fiji-Indian women the number of children born to married women is approximately equal to that for all women. This is not the case for Fijian women. There is, however, little quantitative evidence on the proportion of women who had children before they married or who had children and never married, and the mortality of these children. The Household Survey of the Fiji Fertility Survey (1974) asked the CEB/SL questions of all women, although the main survey was limited to ever married women. The average numbers of children born to never married women by five year age group of women from this survey are used here to estimate the numbers of CEB to never married women, which are then added to those of ever-married women in each age group. For the most part these additional children are born to women who eventually marry. Although Fijian fertility had, in fact, declined somewhat between 1946 and 1974-1976 (the period spanning the FFS and the 1976 Fiji census), this is unlikely to have had a significant effect on pregnancies before marriage. The age of marriage of Fijian women (as measured by the percentage of never married women at younger ages) changed relatively little in this period, in sharp contrast to the age of marriage of Fiji-Indian women (see Table B-1).

Early documentary and anthropological evidence suggests

that Fijian children born before marriage were far from uncommon (see, for example, the Decrease Report and Laura Thompson, 1940b, based on her work in the 1920s). Therefore, pregnancies before marriage were not simply a modern shift in norms related to premarital sex. However, we cannot be certain that the average number of children born to never married women was exactly equal to that reported in the FFS. In the absence of other data these are used here.

Table B-1

Women Never Married in Younger Age Groups
1936 to 1976 Censuses (Percentages)

Age Group	1936	1946	1956	1966	1976
Fijians					
15-19	88.1	86.1	88.1	89.9	89.4
20-24	40.7	32.5	39.9	42.5	43.5
25-29	19.4	17.9	16.6	16.3	17.6
Fiji-Indians					
15-19	16.8	24.7	54.3	77.5	83.9
20-24	8.1	6.1	8.8	21.6	31.5
25-29	7.0	4.5	2.8	5.1	10.1

Table B-2

Fijian Women Never Married; Never Married with One or More Children; Average Children Ever Born to Never Married Women.
Fiji Fertility Survey (1974)

Age Group	Never Married (%)	Never Married with 1 or more Children(%)	Average CEB to Never Married
15-19	89.5	3.8	.04
20-24	36.6	22.6	.25
25-29	12.9	43.3	.66

The percentage of women who had never married at the time of the survey reported in the Household Survey of the FFS is shown in Table B-2. Comparing these percentages with those from the 1976 census (Tables B-1 and B-2) shows that never married women were underrepresented in the FFS. There is no way of assessing how this might affect the average CEB from the FFS. The percentages of women never married with one or more children and the average CEB to **all never married** women are also shown in Table B-2. The averages are applied to the numbers of women never married in the 1946 census by age group for the age groups 15-29. (The numbers at later ages in the FFS are too small to be reliable.) This gives a number of CEB to never married women in

1946, which can be added to the CEB to ever married women which is then used as the numerator in determining the average parities of all women in an age group.

The proportions SL of these children, in the absence of any other quantitative evidence, are based on the same mortality rates (i.e. proportions dead) within five year age groups of women as those of married women. Anecdotal evidence would suggest that this is a conservative estimate, as children born outside of marriage were thought to have higher rates of mortality than children born within a marriage (see, for example, MD1927).

Turning to the 1956 census: here the problem in relation to the data requirements of Brass-type estimates of child mortality is in the coding of women with more than eight children as having had an unspecified 9+. The problem has been illustrated by Zwart (1968) for women 45 and older. In her analysis of the fertility of Fiji-Indian women from the 1956 census MacArthur (1958), in the absence of other data, assumed that women 45 and older in 1956 had had an average of 10 children. However, Zwart found that the average CEB for Fiji-Indian women 45 and older in 1966 was in fact 11.5. The MacArthur analysis had significantly underestimated the fertility for older Fiji-Indian women. On the assumption that her estimates are likely to have been too low for other age groups, either data from the 1946 or the 1966 census must be used to estimate the average number of children born to women who have had 9+ children.

Table B-3

Percentage Women with Nine or More CEB/SL (1956)

Age Group	Fijians			Fiji-Indians		
	% 9+ CEB	% 9+ SL	Base N	% 9+ CEB	% 9+ SL	Base N
25-29	--	--	--	3.1	1.0	5491
30-34	1.8	.04	4465	15.7	8.2	4424
35-39	10.2	3.2	4144	32.9	21.0	3804
40-44	19.6	7.9	3419	38.7	25.6	2692
45-49	26.4	8.6	2655	42.0	28.2	1742

Table B-3 shows the percentages of women in five-year age groups who had had 9+ children in 1956. Since the 1966 census is the better census in planning, implementation, analysis and in the quality of age reporting, it is used here to estimate these numbers. While age of marriage, and therefore fertility, was to show considerable change amongst Fiji-Indian women between 1956 and 1966, fertility amongst older women, the groups relevant to this estimation, had probably not declined in this period.

CEB to women with 9+ children is directly estimated from the tables reported in 1966 showing the numbers of women with children born to the number of 9, 10, etc. The number of women at each parity is multiplied by the appropriate number of

children (e.g. the number of women with 11 children is multiplied by 11) and these numbers are then summed to obtain the total number of children born to women with more than 9+ children.¹ This number is divided by the total number of women having had 9+ children to obtain the average number of children born to women with 9+ children in each age group. The averages derived from the 1966 census are shown in column A of Table B-4.

Table B-4

Correction Factors for 1956 Census Based on the 1966 Census.

Age Group	A Average CEB of Women with 9+ Children (1966)	B Average Numbers SL of Women with 9+ Children SL (1966)
Fijians		
30-34	9.3	9.3
35-39	9.7	9.5
40-44	10.1	9.7
45-49	10.2	9.9
Fiji-Indians		
30-34	9.8	9.6
35-39	10.4	10.0
40-44	11.4	10.4
45-49	11.6	10.6

This average for each age group of women is multiplied by the number of women with 9+ children in 1956. These are added to the CEB of women with parities less than 9 and this total number of CEB is divided by the number of women in each five year age group to obtain the average CEB. This procedure was carried out for women in five year age groups 30-49.

The same procedure was used to calculate the average children still living, again using the 1966 data based on women with 9+ children still living.² The numbers of women are considerable smaller (see Table B-3). Childhood mortality had undoubtedly declined between 1956 and 1966, as the analysis in Chapter V shows. This decline will probably have affected older women least as programmes were aimed at young children. However, the estimates of children SL for women with 9+ children SL may be somewhat too high. It should be kept in mind that for Fijians (the main focus of the analysis) these women are a relatively small proportion of women in each age group. Thus, the preponderance of the information comes from women with fewer than nine children still living. The average number of children SL of women with 9+ children SL are shown in column B of Table B-4.

The 1966 census report grouped together the number of women with CEB/SL of 15+. In the absence of other data, the average CEB was assumed to be 16, and SL to be 15. The numbers affected

are small. For example, in the following age groups -- 35-39, 40-44, 45-49 -- the numbers of Fijian women with 15+ CEB are 10 or fewer. The respective numbers of Fiji-Indian women are 38, 87, 130.

The 1976 census report again grouped together women with CEB/SL of 15+ and the same assumptions were made. The numbers affected are even smaller.

Women who did not state (NS) their CEB, CD or SL are included in the denominator of all the calculations and in the numerator they are treated as 0. The El-Badry (1961) method of correction for non-response has not been used here, as the proportions of NS are small. For example, 5 percent of Fijian women, and 2% of Fiji-Indian women in the age group 20-24 were in the NS category for both questions in the 1956 census. The proportions were considerably smaller at later ages in this census.

The choice of the North Coale-Demeny model for Fijians is discussed in Chapter II. The choice of the East model for Fiji-Indians in the 1946 and 1956 censuses is based on the consistent reporting of high infant mortality relative to child mortality from the earliest Indian Immigration Reports.

The average parities and the average proportions dead based on all five censuses are shown in Tables B-5 and B-6. The correction factors to the 1946 and 1956 censuses are briefly evaluated below as the other corrections are minor ones.

Table B-5

Average Number of Children Ever Born to Women in Age Groups 15-49

Age Group	1946	1956	1966	1976	1986
Fijians					
15-19	.20	.09	.08	.08	.10
20-24	1.12	1.04	.99	.85	.82
25-29	2.34	2.50	2.54	2.10	1.95
30-34	3.53	3.72	3.87	3.32	3.02
35-39	4.48	4.64	4.91	4.38	3.81
40-44	4.70	5.34	5.44	5.07	4.36
45-49	--	5.81	5.46	5.59	4.66
Fiji-Indians					
15-19	.75	.39	.13	.07	.09
20-24	2.47	2.18	1.58	.94	.92
25-29	3.99	4.20	3.68	2.40	2.09
30-34	5.03	5.64	5.37	3.77	2.94
35-39	5.91	6.64	6.73	4.91	3.58
40-44	6.07	7.16	7.39	5.86	4.19
45-49	--	7.42	7.68	6.81	4.91

Table B-6

Proportions of Children Dead to Women in Age Groups 15-49

Age Group	1946	1956	1966	1976	1986
Fijians					
15-19	.119	.092	.061	.050	.024
20-24	.144	.107	.061	.046	.031
25-29	.174	.131	.074	.046	.031
30-34	.201	.149	.092	.064	.035
35-39	.187	.173	.114	.063	.042
40-44	.249	.190	.142	.080	.052
45-49	----	.222	.173	.103	.064
Fiji-Indians					
15-19	.117	.104	.086	.067	.033
20-24	.111	.112	.085	.054	.030
25-29	.123	.112	.090	.054	.036
30-34	.129	.121	.102	.066	.046
35-39	.124	.129	.114	.072	.060
40-44	.169	.174	.131	.083	.069
45-49	----	.169	.144	.115	.075

Sources : Fiji Census Reports, 1946, 1956, 1966, 1976, 1986.

The corrections to the reported CEB/CD/SL in the 1946 and 1956 censuses produce average parities and proportions dead which are reasonable in relation to later censuses. However, the overall reporting of CEB/CD in the 1946 census is relatively poor especially for Fiji-Indians. In relation to the 1946 census, only the estimated average parity for Fijian women aged 20-24 has a substantial correction (as a result of the correction for children of never married women). The 1946 estimate is reasonably close to the corresponding estimate for 1956. What appears to be an increase in fertility in 1956 in both ethnic groups is probably the result of better interviewing rather than of any real change in fertility. The fact that this increase in CEB is found in age groups which were not corrected for 9+ children as well as those which were, suggests that it is not a result of the correction factors. The proportions dead in the 1956 census are plausible for both ethnic groups.

The graphs of the indirect estimates of infant mortality for both ethnic groups are shown in Figures IV-1 and IV-2 in Chapter IV. The estimates based on women aged 15-19 are not used here as they are generally unreliable and in the case of Fijians are based on a very small number of births; the estimates based on women 45-49 in 1946 are not used, as these women were born about the end of the century and are a selective group of survivors.

The Fiji-Indian estimates for 1946 are poor. The mortality estimates are lower than those based on the 1956 census. But they are used here only to demonstrate the high level of underregistration of vital events.

The estimates for Fijians are better, although there is a discrepancy between the two estimates for the early 1940s; this

may be the result of underreporting of dead children in older age groups in 1956, the correction factors in 1946, or it may reflect the epidemic mortality of 1944. The estimate for 1938 is out of line and suggests underreporting of dead children. The estimates for Fijians improve in later censuses. On measure of this is the degree to which the series dove-tail together. Although there is some discrepancy between the estimates based on the 1956 and 1966 censuses for the early 1950s they are fairly close. (Possible reasons for this are discussed further in section 2 of chapter V.) After this the series come together well (see Figure II-1).

1. The data for CEB 15+ are grouped together. In the absence of any other data an average of 16 was used for both Fijians and Fiji-Indians.
2. In the absence of other data and since the numbers were small, 15 was used as the average for those with 15+ children.

APPENDIX C
MEASUREMENT OF LITERACY IN THE 1911, 1921, 1936 CENSUSES

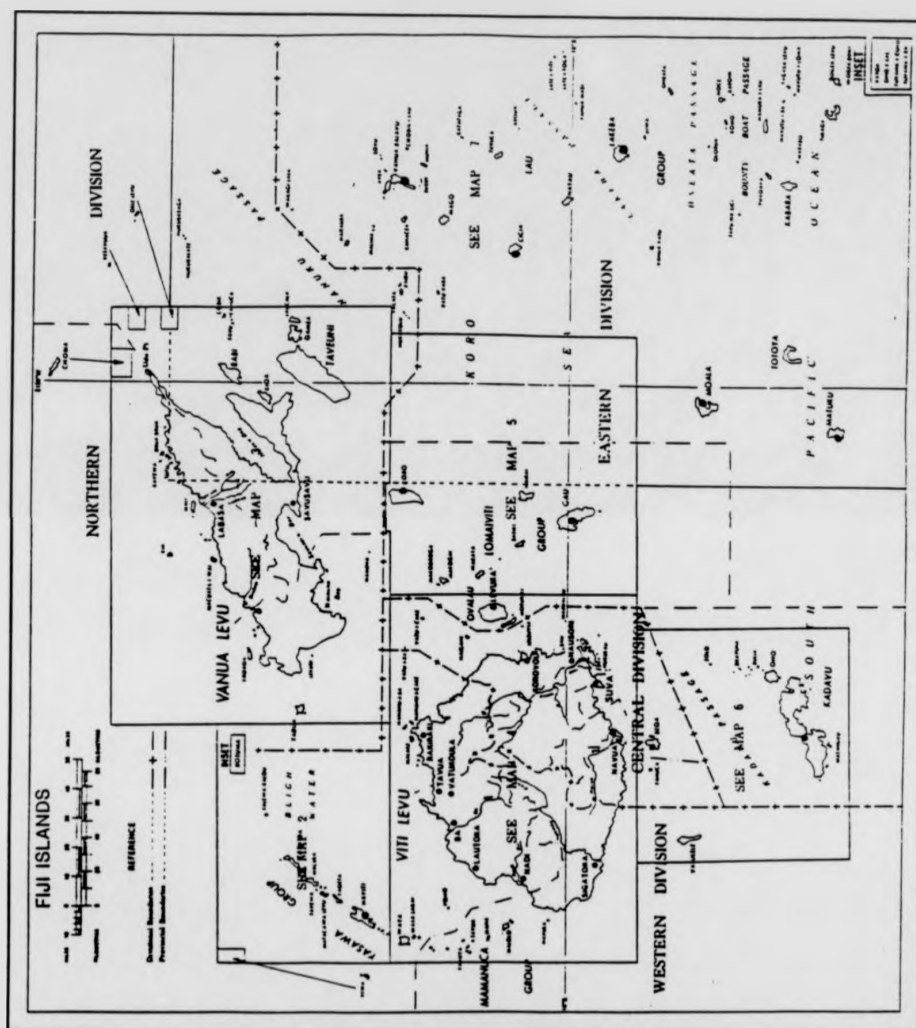
The literacy series shown in Table III-2 are not perfectly comparable as the reporting differs in all three censuses. In the three censuses reading and writing are combined in the same question. Thus, there is no possibility of assessing the proportions who read but do not write. The 1911 census did not ask age in years but used grouped ages e.g. "youth", as described in Chapter II. The 1921 and 1936 census asked age in years.

The 1911 census reports the numbers of "adults" and "children" who were not "able to read and write" and the total of both who were able to do so. These numbers are shown by province with a separate category for those who are living away from their villages, about 6% in 1911, in census Table 23. To estimate the numbers of adults who are literate it is assumed that "adult" refers to "youth", "adults" and "aged". This would appear to be the case from an analysis of the literacy table where the total numbers equal the totals in the province minus those living away, shown elsewhere in the report. The numbers of adults by province is obtained from census Table 21. The numbers of adults who are not literate is obtained from Table 23, thus giving the number and proportions who are literate. Those living away are treated as a separate category in both tables.

In 1921 the literacy question is asked only of those who are over 15, again those living away from their villages are a separate category.

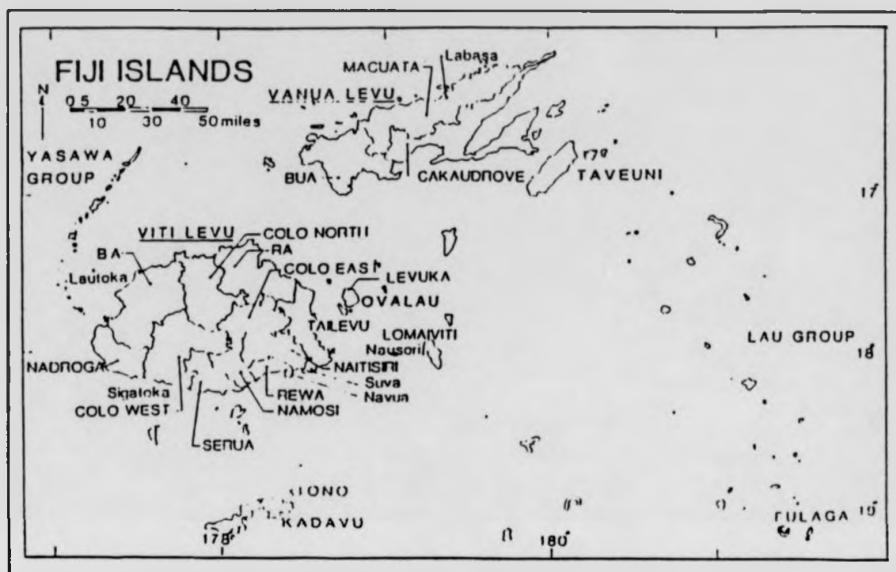
In 1936 the literacy question ("able to read and write in one language") is again asked of those over 15 but the reported literacy tables do not differentiate those who are living away from their villages. The provincial totals, therefore, include these. By 1936 17% of the population were living away from their villages. Based on earlier censuses those living away were somewhat more likely to be literate than was the case for the adult population as a whole. (In 1911, 82% of those living away were literate, in 1921 of men the percentage was 85%, women 76%). Thus, this inclusion would bias the 1936 provincial proportions upward.

Map 1
Map of Fiji - 1976



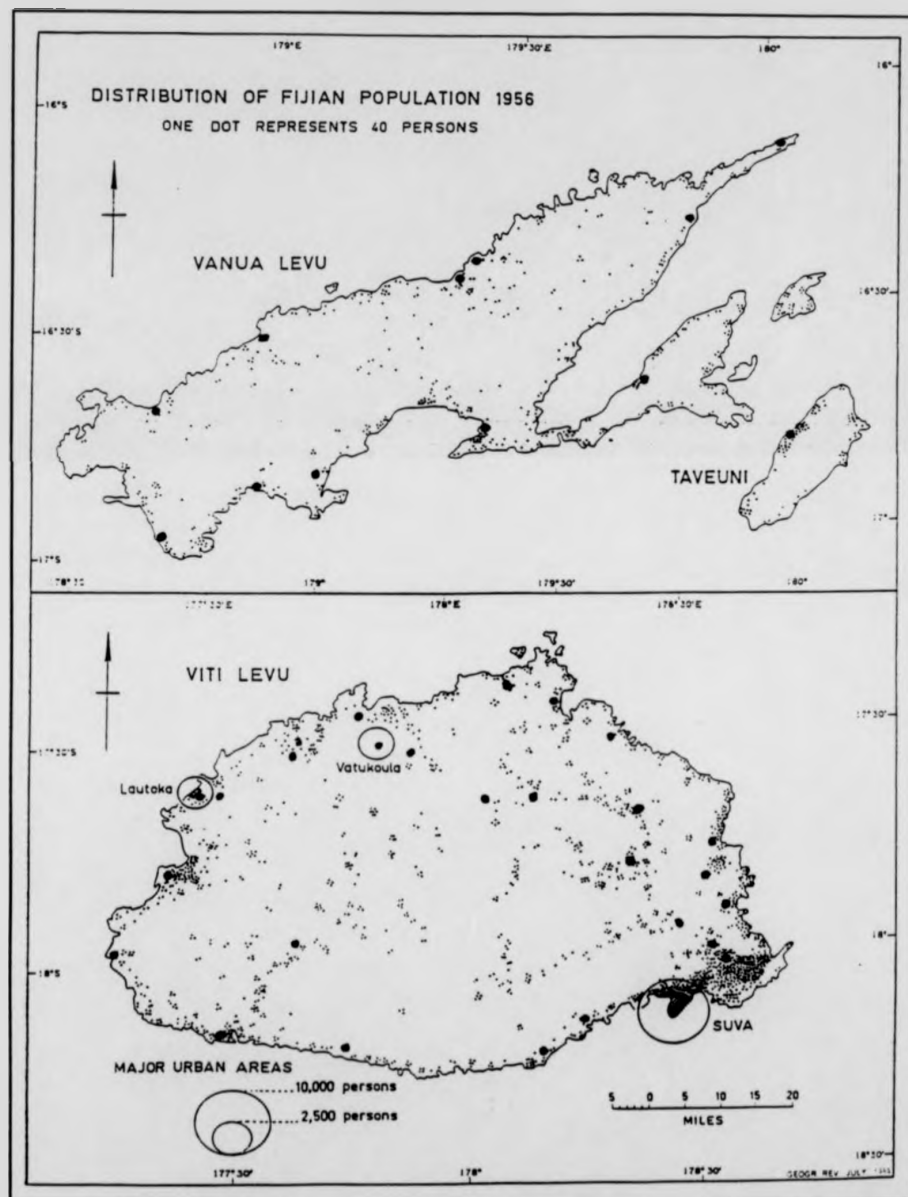
Source: Map 1, Report of the 1976 Census
 Black dots on outer islands have been added to show location of
 hospitals and dispensaries 1930 - 1950 see Map 3.
 Black dots on the main islands show urban areas.

Map 2
Approximate Location of Provincial Boundaries - 1915

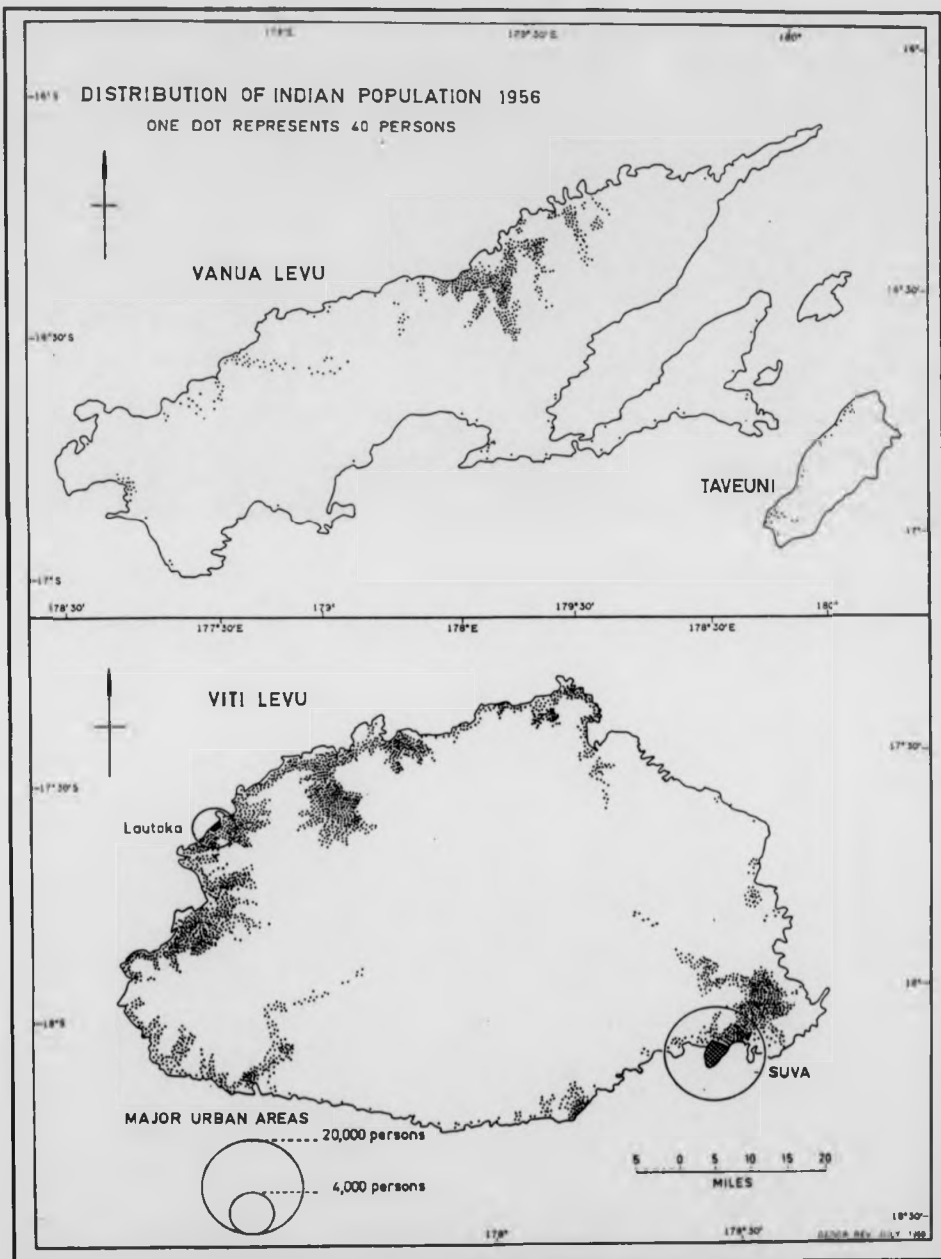


Source: Manning, 1985; with permission of the University of Hawaii.

Map 3
Location of Hospitals and Dispensaries
Viti Levu and Vanua Levu
(Indicated by large dot)



Map 4
Distribution of Fiji-Indian Population, 1956



Source: Ward, 1965 (with permission of the Geographical Review).

ABBREVIATIONS AND ACRONYMS	
ABSV	Absolute number value of difference in numbers of births between an index year and the previous year.
AMO	Assistant Medical Officer
AMP	Assistant Medical Practitioner
ARI	Acute Respiratory Infection
ASFR	Age-specific Fertility Rate
BCG	Bacille Calmette-Guerin
CDR	Crude Death Rate
CO	Colonial Office
CEB	Children Ever Born
CMO	Chief Medical Officer
CMR	Child Mortality Rate
CNS	Central Nervous System
CP	[Legislative] Council Paper
CR	Census Report
CS	Children Surviving
CWC	Child Welfare Campaign
CWM	Colonial War Memorial [Hospital]
CWW	Child Welfare Work
DHS	Demographic and Health Surveys
DMO	District Medical Officer
DPT	Diphtheria, Pertussis and Tetanus vaccination;
FA1950, 1951	Fijian Affairs Report 1950, etc.
FFS	Fiji Fertility Survey
GNP	Gross National Product
ID	Infantile Diarrhoea
II1907, 1908	Indian Immigration Department Report 1907, etc.
IMR	Infant Mortality Rate (Children under 1)
INH	Isoniazid
MD1950, 1951	Medical Department Report 1950, etc.
MDR	Medical Department Report
MLTF	Family of Model Life Tables
MOI, MOII, MOIII	Medical Officer Grades I, II, III
NA1950, 1951	Native Affairs Department Report 1950, 1951, etc.
NMP	Native Medical Practitioner
NND	Neonatal Deaths
NNMR	Neonatal Mortality Rate
NOBN	Native Obstetric Nurse
NS	Not Stated
ORT	Oral Rehydration Therapy
PAM	Penicillin Aluminium Mono-sterate
PMR	Perinatal Mortality Rate
PNNMR	Post-neonatal Mortality Rate
q1, q2	Life table probability of dying before age 1, 2
RG1950, 1951	Registrar-General's Report 1950, etc.
RGR	Registrar-General's Report
SB	Stillbirths
SBR	Stillbirth Rate
SL	Still Living
TB	Tuberculosis
TFR	Total Fertility Rate
TU	Tuberculin Units
UNICEF	United Nations Children's Fund
VR	Vital Registration
VSNP	Vital Statistics of the Native Population
WC	Whooping Cough; Pertussis
WFS	World Fertility Survey
WHO	World Health Organisation
WPHS	Western Pacific Health Service
WWII	World War II

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Fiji Government department reports are cited as follows: MD1910 is the Medical Department Report for the year 1910; NA1910 the Native Affairs Department Report for 1910, FA the Fijian Affairs Department report, II the Indian Immigration Department report, and RG the Registrar-General's Report. They will not normally have been published until at least a year after that to which they refer.

Many of these documents, especially Departmental Reports, are in the Legislative Council Report series, and bear an index number "CP**/XX", XX being the last two digits of the publication date, and ** being the accession number for that year. They may be cited in the text in this way.

In the Public Record Office, London, Fiji papers are in the series C083/** and C085/**, (** being an accession number) and they are normally cited thus in this text. In some cases, this number has been the most convenient one to use in the citation in the text.

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